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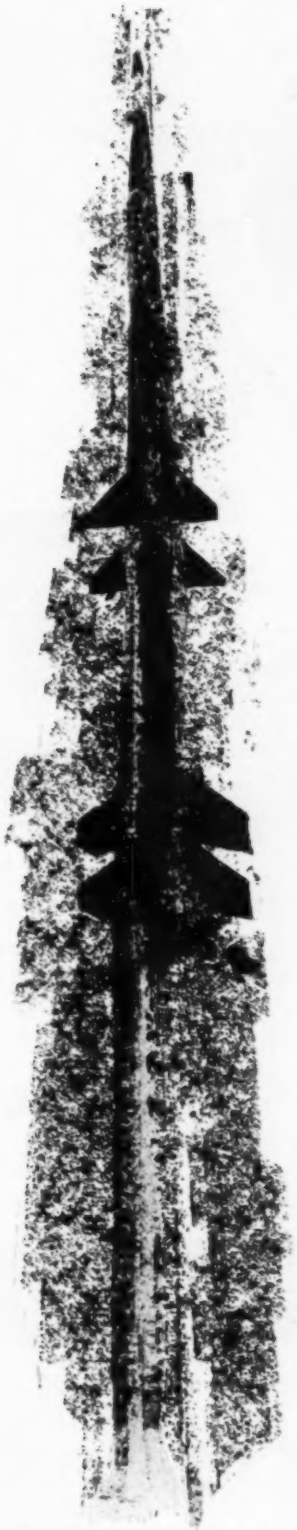

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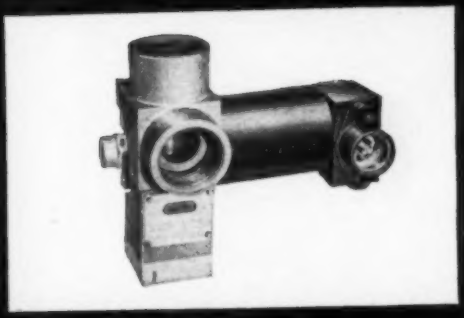

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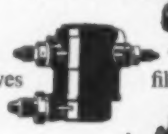
Fuel Tank Pressurisation Systems, designed to meet various operational requirements such as nitrogen blanketing and tank pressurisation, include servo and non-servo systems using servo control valves pressure reducing valves  filter/restrictor valves air or air/nitrogen control valves servo and direct acting vent valves.

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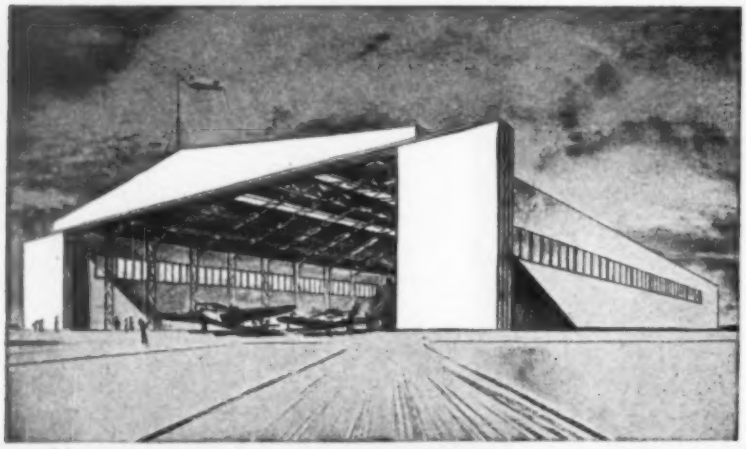

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No 2557 Vol 73 FRIDAY 24 JANUARY 1958

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New York, N.Y.
Thomas Skinner and Co. (Publishers), Ltd.
111 Broadway, 6
Telephone · Digby 9-1197

ANNUAL SUBSCRIPTION
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Canada and U.S.A. $15.00.

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Wingless Deterrent

IN our review of the world's guided missiles last December we remarked that long-range ballistic weapons had in the past twelve months emerged from being shadowy paper projects to become a series of thunderous metal cylinders. Biggest and most thunderous in the Western world is Convair's Atlas.

Atlas is, perhaps, the most impressive piece of ordnance ever built. The most hardened observer could not fail to be immensely moved—mentally, if not actually physically—by the firing of such a weapon. Size, shape and sheer presence are awesome; and the mere static firing of the rocket motors releases such power as to threaten to tear the earth asunder (and to create quite remarkable effects on the human frame should one approach nearer than half a mile).

Yet it is by no means correct to regard the ICBM (intercontinental ballistic missile) as something in which engineering tolerances, constructional methods, materials and other factors are exceptionally new and clever. The Atlas airframe is little more than a big empty cylinder, made of ordinary materials fabricated in ways well understood by any company familiar with supersonic aircraft.

The fact is that there are only two major technological advances in an ICBM: the low-drift inertial gyro system and the construction of the nose cone. For the rest, Atlas is just a transportation system. Its payload is a thermo-nuclear warhead, weighing several tons and with a yield equivalent to at least as many million tons of T.N.T. Its airframe and propulsion system are nothing like as complicated as those of a B-52 or a British V-bomber, and they are appreciably quicker and cheaper to manufacture. The real effort is needed in the guidance system, and, to an even greater degree, in the extensive ground equipment and vast firing installations which complete the weapon system. Getting an ICBM into service with a user formation is a slogging match against petty failures—failures probably arising from the fact that when the part concerned was designed nobody could say just what it would have to do, or under what conditions. The next generation of ICBMs—and the orbital and hypersonic winged devices that will also be required—will be designed for predictable conditions, and should rapidly pass into service.

Our own Ministry of Defence, however, must bear in mind that pilotless vehicles cannot at present promise to perform more than 60 per cent of long-range bombardment tasks—and that is a generous estimate.

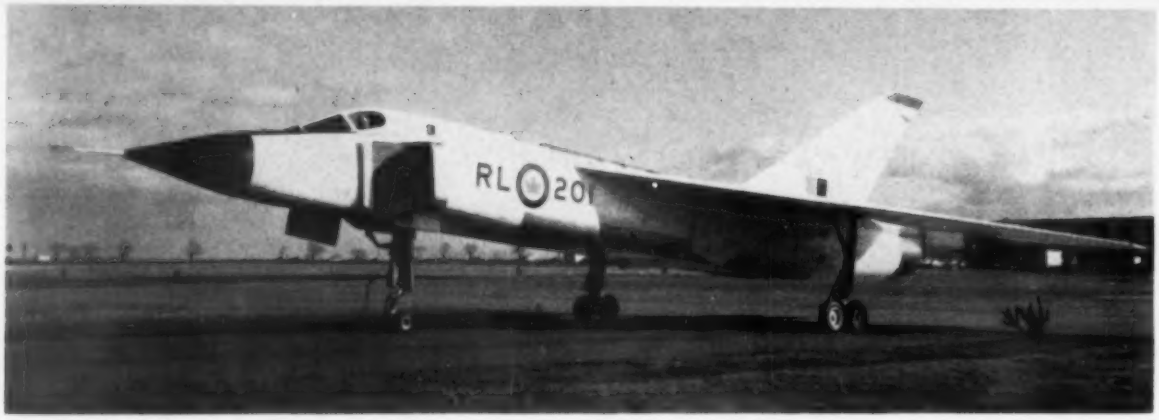
The One That Got Away

UNNOTICED in the shadows of the passing year a man escaped. On his head was the price of being the millionth person to fly the Atlantic in 1957. If the airlines had got hold of him he would have been besieged by Pressmen, blinded by flash-bulbs, strangled with garlands and presented with a dubious medallion commemorating something of which he was sublimely unaware—that he was the first air traveller ever to follow 999,999 others across the North Atlantic in any one year. Realization that it took eight post-war years for the annual volume of this traffic to reach 500,000, but only a further four years to reach the million mark, would probably have evoked in him no more than a grunt of passing interest.

The airlines knew quite a lot about this particular character. He was probably male, married and middle-aged. Very likely he was an American executive returning tourist-class after a longish visit to Europe.

It was no accident that the airlines allowed him to travel unmolested. Although in the spring they had confidently forecast that 1957 traffic would comfortably exceed one million passengers, by the late autumn they were unhappily speculating whether or not their celebrations would have to be postponed for another year. So it was that our anonymous friend's journey, carried out in the last days of the old year, was cause for relief rather than for jubilation.

This year and next will see airline publicity men waiting hopefully to announce that the airliner has replaced the ocean liner as the North Atlantic's major vehicle. Then the hunt will be on again, this time for a certain "economy-class" passenger, the two-millionth to travel in 1960—or will it be 1961?



ON THE MOVE: Chief experimental pilot Jan Zurakowski conducts the Avro Aircraft Arrow on its first taxying trials at Malton.

FROM ALL QUARTERS

B.E.A.'s Jet: The Deadlock Continues

THOUGH the Hawker Siddeley Group and Bristol have not so far decided to build the Bristol 200 short-range jet airliner the two firms have elected to show the world what their project looks like, and to publish a few outline details (see page 109). The decision to do this, and to announce the departure for America of a sales team headed by Dr. A. E. Russell, chief engineer of Bristol Aircraft, was symptomatic of the *impasse* reached last week in the long drawn-out negotiations concerning B.E.A.'s jet.

This latest move does not, apparently, mean that the Bristol-Hawker Siddeley team have, for the time being, abandoned their hopes of the B.E.A. order. But their action, at a critical stage of the round-table discussions with B.E.A. and the Ministries of Supply and Transport, was surprising. If the "invitation from a prominent American airline" represents the possibility of an order for the 200, the situation at home may be dramatically changed in favour of the immensely powerful combine. Unfortunately, most American airlines are not in a buying mood at the moment, and will not be while the Civil Aeronautics Board's future domestic fares policy is undecided. And there is no doubt that new British transports are more readily accepted in the export market if they have first been accepted by one of the Corporations.

Despite these handicaps the sponsors of the Bristol 200 clearly wish to demonstrate the confidence they have in their conception of the ideal short-range jet, and in their own ability to go-it-alone.

In the meantime, de Havilland decline to comment on reports that the Hawker Siddeley group had "turned down" a D.H. offer to join forces. Significantly, a B.E.A. statement last week made no reference to the inclusion of Hawker Siddeley in the negotiations at that stage. It was probable, therefore, that the aim of last week's round-table talks was to arrange a match between Bristol and de Havilland. This, it is clear, failed; and now it appears that if B.E.A. are to get a fleet of D.H.121s, the Government will have to accept a smaller-scale industrial regrouping with de Havilland as the central figure. B.E.A.'s reasons for not so far accepting the Bristol 200, and the powerful team which backs it, are their own; but these reasons will have to be acceptable to the Government if Treasury sanction of the £20 million contract with de Havilland is to be forthcoming. A new financial aspect of the de Havilland proposals is the likely support of the extensive shipping interests which back Hunting Aircraft—one of the firms included in the D.H.121 consortium.

B.E.A.'s position was last week described by the chief executive, Mr. Anthony Milward, as "unenviable." The Corporation was, he said, in a position to "make or break" firms in the aircraft industry. A deputation of de Havilland employees last week told the Ministry of Supply that large-scale redundancy would result if D.H. did not get the B.E.A. order.

Large Solid-propellant Missiles

ONE week ago, on January 17, what was described as "a Polaris test missile" was fired from the U.S.A.F. Missile Test Center at Cape Canaveral, Florida. The U.S. Navy stated that the firing was successful and added that the vehicle was propelled by "a forerunner of the Polaris propulsion engine." Polaris is the fleet ballistic missile of the U.S. Navy and has a unique solid-propellant motor in which a single plenum chamber feeds multiple nozzles, as described in our special issue of December 6 last.

A cryptic announcement by the U.S. Army states that their "new solid-fuel missile" will be named after the late General John J. Pershing" (the General commanding the U.S. Army on the Western Front in 1917-18). The Pershing will apparently be a simplified development of Redstone, a large ballistic weapon with a range of the order of 200 miles. The switch from liquid propellants will reduce costs and greatly improve the general ease of handling and operation of the weapon, particularly in the forward areas. Already the smaller Corporal is being replaced by the solid-propellant Sergeant. These weapons were also described in our December 6 issue.

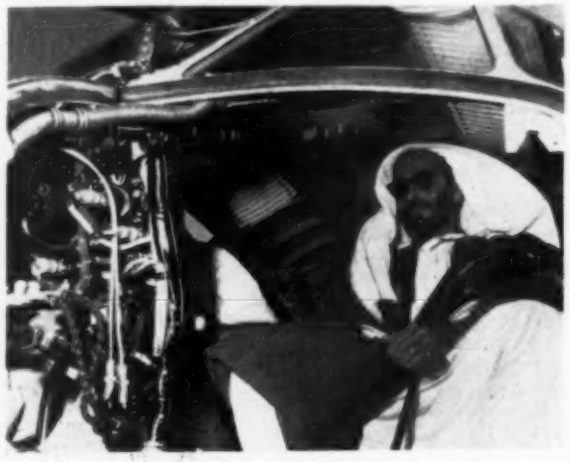
N.A.39 Powerplants

ON January 21, the de Havilland Engine Company were permitted to reveal that the Blackburn N.A.39 naval strike aircraft is to be powered by two Gyron Junior turbojets. It may be remembered that the announced thrust of the DGJ.1 is 7,000 lb and that a new version of the engine, presumably with increased thrust, has been running since last October. The Junior has also been demonstrated with an air-bleed manifold for flap-blowing and other purposes. The first prototype N.A.39 is in an advanced stage of construction and scheduled to fly in the spring of this year.

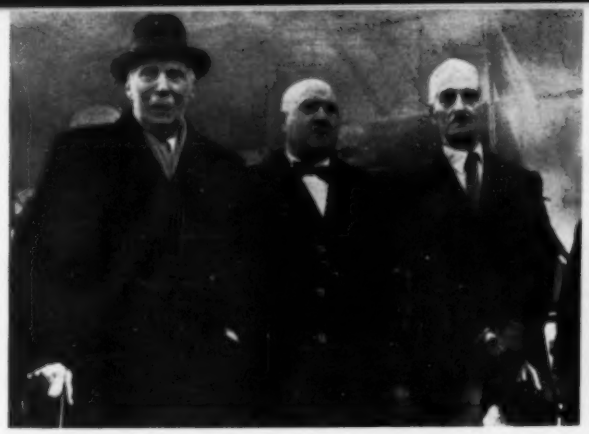
Biggin Hill and Fighter Command

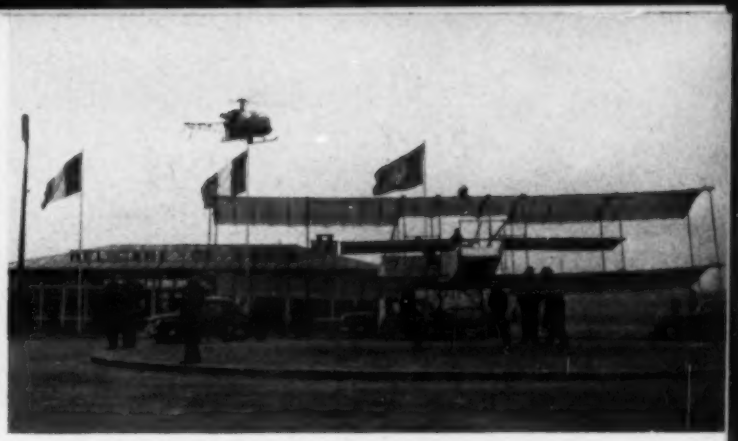
AT a ceremony at Biggin Hill on Thursday of last week, No. 41 Sqn. handed over its Standard (and its number) to a Standard party from No. 141 Squadron, Coltishall. In conformity with present policy, therefore, the number of this famous fighter unit is being preserved, but it is being taken over by a Javelin unit; and Fighter Command is to lose Biggin Hill itself on March 1. The geographical position of the airfield is now unsuitable to meet an air attack on this country; and its runways are too short for the P.1. The standard length is to be 2,500 yd and several runways have already been so extended. Tangmere and North Weald are also to be closed, but West Malling will remain in use. Most fighter bases will be distributed along the East Coast. The remaining flying Hurricane and Spitfires will go to Martlesham Heath.

Reviewing officer at the handing-over ceremony, the first of its kind to be held in the R.A.F., was Air Chief Marshal Sir Thomas Pike, A.O.C.-in-C. Fighter Command. After the parade he affirmed that Fighter Command would remain in existence as the main air defence agency for the United Kingdom, but added that consider-



RULER OF ABU DHABI, Sheikh Shakhbut bin Sultan, recently visited the mobile drilling barge "Adma Enterprise" in the harbour at Das Island (p. 10, "Flight," January 3). The Sheikh is seen in a Westland Widgeon, used for communication between Das Island Base and the rig.





TWO OF THE GREATEST of France's air pioneers Henri Farman (left) and Gabriel Voisin (right) are seen with M. Christiaens, French Secretary of Air, at the commemoration of Henri Farman's first closed-circuit flight in a Voisin on January 13, 1908. The ceremony was held at Issy-les-Moulineaux, near Paris, whence a Sud Alouette helicopter—seen above the historic Voisin biplane—once again flew the circuit.

able changes in equipment would take place. Early marks of Hunter were already being withdrawn and, in a few years' time, P.1s would begin to replace the Javelins. The P.1 would remain in service until 1968 or a little earlier and, when supplemented by ground-to-air missiles, would take on the long-range defence some hundreds of miles from the coast.

The first Bristol Bloodhound, said Sir Thomas, was expected in two months' time and would be quickly followed by later marks which offered "thrilling" and "exciting" developments. Range of the early model was already over 25 miles and interceptions at very much lower heights would be possible later. The English Electric Thunderbird, which had a rather better low-altitude capability, would also join Fighter Command. Eventually, missiles would take over the whole defence task, but for at least ten years manned intercepters would be needed, firstly to provide a means of visually inspecting unidentified radar contacts and secondly to form the outer air defence ring beyond missile range. Fighter pilots were already being trained for surface-to-air missile duties, and recruiting of boy entrants for skilled trades was most encouraging.

Biggin Hill is not to be closed altogether (University of London Air Squadron is now based there) and the traditional Battle of Britain "At Homes" will continue to be held.

Jet Let-down Trials with Decca

AS part of a general study of the problems of bringing mixed jet- and piston-engined traffic smoothly down to a runway, a Comet 2E of B.O.A.C. fitted with Decca Navigator and Flight Log has been flying a series of holding patterns and let-down paths off the north of Scotland. Preliminary trials were made using a radar trainer at Hurn. The work was done for the M.T.C.A. Air Traffic Control Experimental Unit.

Holding patterns and let-down paths, suitably marked with required flying heights, were printed on the Flight Log charts and the aircraft was able to follow a precise sequence of manœuvres down to the threshold of an imaginary runway out at sea. The prescribed tracks took into account the need of jet aircraft to reach cruising height as soon as possible after take-off and to descend as late as possible before landing. The Decca equipment, it is reported, allowed the pilot to follow the prescribed pattern precisely; and the average time error at the departure point from the holding pattern was only nine seconds during a series of trials. Further tests are to be made in the near future.

A Minister on Cost-cutting

SPEAKING at last week's opening of the new valve factory and laboratory of Standard Telephones and Cables, Ltd., at Paignton, Devon, Mr. Aubrey Jones, Minister of Supply, remarked on the need for industry to have contact with a Government department able to understand technological problems, adding that he had little sympathy with those who regarded the Ministry of Supply as redundant. The Minister continued:—

"My other connection with you is that I place military orders with you. Sometimes I cancel them. I have been doing some cancellations lately—and thereby hangs a very long tale and a very large issue. Military research and development these days takes a long time. It has been growing extremely rapidly, and I don't think anyone would disagree that on economic grounds it needed to be cut back somewhat.

"If it hadn't been for the reductions made last year it would have increased this year by at least ten per cent—not only because of rising costs, but also because, if full use is to be made of scientific progress, all projects necessarily become more complex, and therefore more costly. So some projects had to be, and were, cut out. These cuts have fallen not only on industry but also on our own establishments. Not only will our intramural costs be maintained within last year's figure, they will actually be decreased.

"I myself have been concerned at the amount of money which has gone out from my department on the fringe of the military programme—for instance, in support of aircraft firms. That is what the controversy over the B.E.A. jet—in which I have been deeply involved—is about. I am not, I hope, one to dictate to any customer what he should have; but it is my concern that the customer's requirement should not be satisfied in a way which may involve untold financial liabilities on my department or throw on my departmental research establishments a load of work which could well be performed in private facilities.

"I also wish to make it plain that I am a firm believer in military research and development and that I should deprecate very strongly indiscriminate cutting and slashing in such development. Not only for military reasons—though military security is in fact a very important contributor to financial soundness; I say it primarily for economic reasons, for I believe military research and development to be one of the most potent instruments of economic progress that we have.

"A policy aiming at economic soundness will not destroy military research and development, it will use the military work to force civil progress along.

"We must place our military contracts with firms which are in the civil field as well as in the military, so that the techniques learned can be passed along. That is one reason why I want to see aircraft firms do other things as well as aircraft. Secondly, we must in appropriate cases use the Government defence research establishments to do civil as well as defence work. And I am trying to do this with the Ministry of Supply establishments. It would be a waste of scientific facilities not to. Thirdly, we must do all we can to encourage the export of defence equipment. It is an important means of securing a quick dividend from research and development. That was why I thought it right to go to Germany to try and sell the SR.177. I am only sorry I failed."

India's First Gnat

THE second Folland Gnat Mk 1 completed for the Government of India was despatched last week-end to India in two Fairchild Packet freighters of the Indian Air Force. This was the first Indian Gnat to be delivered (the first aircraft actually completed under the contract with the Indian Government is engaged on development flying at Chilbolton). A picture on this page shows the Gnat fuselage being loaded into one of the Packets. On arrival at the depot at Kanpur the Gnat will be assembled by Indian Air Force personnel. Folland have contracted to supply India with 25 complete Gnat Mk 1s and 15 sets of components. The Gnat will also be built under licence by Hindustan Aircraft, Ltd.

CATCHING A PACKET: As related in a news item on this page, the second Folland Gnat Mk 1 for the Government of India has been despatched in two Fairchild Packets of the Indian Air Force. Here is the fuselage going aboard.

NORTH AMERICAN X-15

Fastest and Highest Manned Vehicle

CONSTRUCTION of the X-15, latest in the series of U.S.A.F./Navy/N.A.C.A. rocket-propelled research aircraft, is now nearing completion at the Los Angeles division of North American Aviation, and the first flights are scheduled for the coming summer. Scott Crossfield, the former N.A.C.A. test pilot, who made many flights in the earlier Bell rocket aircraft, joined North American about eighteen months ago and is training for the acceptance test flights. Then the X-15 will be handed over to Maj. Ivan Kincheloe, who has already flown at 1,650 m.p.h. and over 90,000ft, for the full research programme. By the end of this year, Kincheloe is expected to achieve a height of 100 miles. With some form of boost, attempts will then be made to reach heights of about 400 miles and to gain practice at re-entering the earth's atmosphere safely. If all goes well, it is hoped that Kincheloe will finally be able to put the X-15 into an orbit at some 12,000 m.p.h. and make a controlled return to earth.

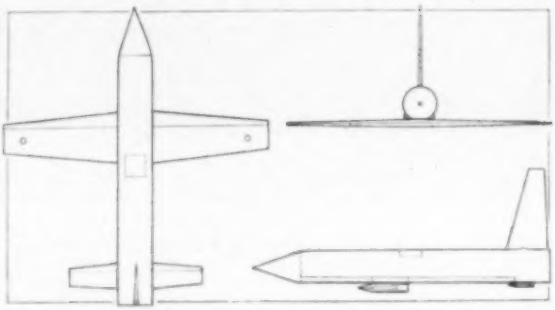
Although in recent months the overall programme has, like all research and development, suffered from increasing financial stringency, some $50m has already been spent in the design and construction of two X-15s, and further appropriations have been made for a third airframe which is to be completed later.

Very little firm information on the configuration of the X-15 has been published, but *Flight* artist Arthur Bowbeer has prepared the accompanying three-view drawing and sketches from photographs of wind-tunnel models published by North American.

It is only to be expected that the X-15 should have an appearance quite unlike that of any previous aeroplane. The only current vehicle designed to "fly" at Mach 5 is the U.S. Army's Redstone ballistic weapon, and this has set the fashion with its conical nose, cylindrical body and thick aerodynamic surfaces with trailing edges which are just as blunt as their leading edges are sharp. Such surfaces are also employed by the X-15, and the section chosen is perhaps best described as "parallel single-wedge," except for the fin which is a simple single wedge. Considerations of "systems," cockpit and landing gear are obviously subordinate to the maintenance of the correct shape.

Power is provided by a single-chamber rocket motor. Curiously, in view of the fact that the airframe is built by America's largest rocket maker, this powerplant is designed and built by Reaction Motors, Inc., at Lake Denmark. Sea-level thrust is rated at 60,000 lb; the complete unit is very neatly mounted as a single package weighing about 1,000 lb, and it is fed with propellants (presumably liquid oxygen and kerosine) for a total burning time of up to about 200 seconds. It has never been suggested that the X-15 should take off conventionally, and it is logical either to drop it from a B-52 or B-58 or to fire it up vertically riding on a Navaho boost package. The latter, which can provide up to 495,000 lb thrust (giving acceleration beyond that acceptable to a human pilot), was illustrated on p. 904 of our December 6 issue.

Even climbing vertically, the thrust of 60,000 lb (more at altitude) would accelerate the X-15 to over Mach 3.5 while it was still well within the atmosphere. This would create a temperature rise (100 per cent adiabatic) of rather more than 1,000 deg F, the limiting temperature for accessory systems currently under development. North American themselves are well advanced with an electronic system capable of working indefinitely at 600 deg F, and this could probably withstand appreciably greater temperatures for a few minutes. Republic Aviation have a 1,000 deg F hydraulic system—included in which are certain actuators designed for ambient conditions of 1,200 deg—and Lockheed's Georgia Division have evolved a 1,000 deg F pneumatic system.



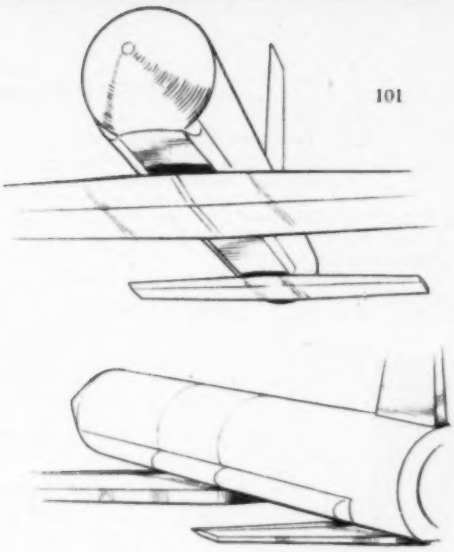
The stainless-steel model of the X-15 in the great 7ft × 7ft Mach 3.5 tunnel of North American Aviation's Los Angeles Division.

Airframe materials, cockpit conditioning and power sources for the accessory systems can only be surmised: special steels and high-nickel alloys will clearly be needed for leading edges, although light alloy might suffice for the bulk of the skinning. The best heat-sink is probably the rocket propellants, and shaft-power will doubtless be obtained off either an *ad hoc* A.P.U. or the rocket turbopump shaft. The flying controls take the form of air jets, as shown in sketches. When no atmosphere is present an aileron or elevator can do nothing; but a tiny air jet, giving a force of a pound or two, can provide full control. In the absence of any other source, the air may be tapped from bottles, as it is in the "iron cross" test rig.

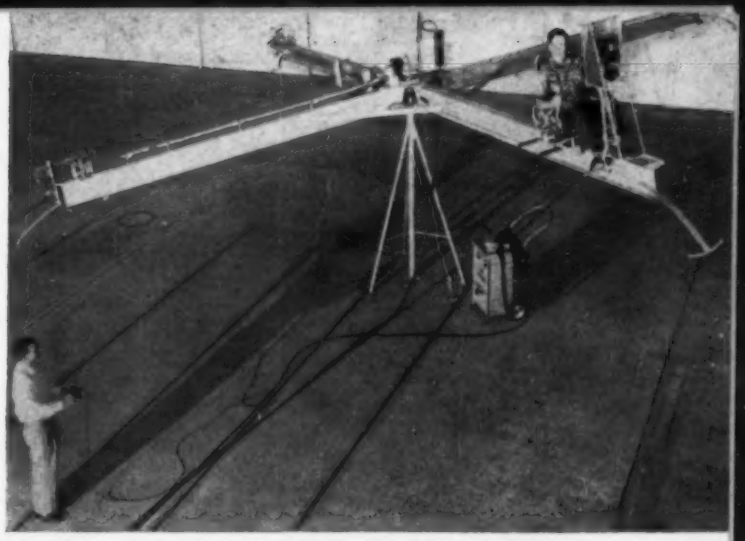
One of the mysteries is the precise location of the cockpit. Both nose and tail will be much too hot for human habitation; tankage, instrumentation and controls will require a good deal of space, and, if the c.g. is to be maintained despite rapid changes in loading, the cockpit will probably lie in the forward section of the fuselage, but well clear of the "hot" part of the nose. The tunnel models give no indication of a canopy, and it is likely that a periscope is to be used to assist vision. The general view of the cockpit published in the N.A.A. annual report for 1957 indicates that the top of the hatch forms something like a canopy; considering the diameter of the fuselage, the level of the pilot's head and the probable fairly high angle of attack on landing, visibility must be at a premium.

As for safety, a statement by Scott Crossfield in April last year, showed that the pilot will have an "escape system pack-

Above, the full-pressure helmet which Scott Crossfield will wear when seated in the X-15 cockpit, of which a mock-up is illustrated in the sketch on the left.

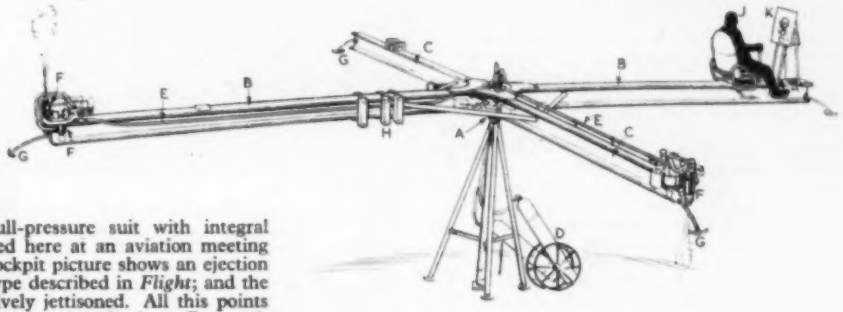


Details (above) of the X-15 wing/fuselage junction.



The photograph above and the diagram below depict the "Iron Cross" test rig with which the N.A.C.A. are experimenting in efforts to find a control system which the X-15 can use in outer space.

A Gimbal mounting
B "Fuselage"
C "Wing"
D Compressed-air cylinders
E Air feed pipes
F Control jets
G Sprung limit stops
H Ballast
J Pilot
K Instrument panel

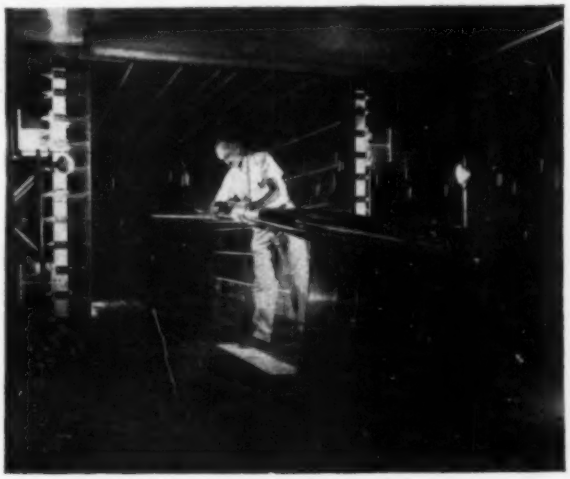


age." Crossfield modelled a full-pressure suit with integral harness and the helmet illustrated here at an aviation meeting shortly before Christmas. The cockpit picture shows an ejection seat of the Convair "bob-sled" type described in *Flight*; and the clam-shell canopy can be explosively jettisoned. All this points to more-or-less "conventional" escape by ejection. But such equipment could hardly function at the speeds at which the X-15 will be flying—nor for that matter at its operational heights. It therefore seems likely that the complete escape system involves a jettisonable portion of fuselage for initial escape in extreme conditions, followed by a more conventional ejection from the capsule at more hospitable speed and altitude. This was indeed the system applied (without ejection seat) in the Bell X-2. When Capt. Milburn Apt lost his life in the X-2 last year, his capsule separated safely from the rest of the airframe at considerable height and speed, but recovered camera records showed that Apt was badly shaken in the process and did not complete the escape by baling out of the capsule. This phase will probably be automatically controlled in the case of the X-15. Scott Crossfield seems to have considerable confidence in the apparatus and has said that he expects it to give him a "92 per cent chance" of escape even in the most unfavourable circumstances.

Just as the escape system is a composite of two distinct techniques, so the pressurization seems likely to combine a pressurized and conditioned cabin with a full-pressure suit kept at least partially inflated all the time. This is the more likely, in view of the fact that none of the full-pressure suits so far revealed have been entirely satisfactory in giving the wearer a normal degree of mobility. It is doubtful, too, whether the pressure in the suit could otherwise be safely built up to survival level quickly enough to overcome sudden decompression. The pilot's breathing air and oxygen would be supplied to the suit alone, and both this air and the cabin air would be temperature controlled. Thus, both in temperature and pressure the pilot would have a double wall of safety round him. The question of poor mobility is partially overcome by keeping the suit at a relatively low level of inflation and by replacing the conventional control column by a shorter lever on a console to the pilot's right. Such a layout is suggested by the position of the pilot's arms in the cockpit picture and to some extent also by the control column fitted to the "iron cross."

Although the X-15 will be capable of taking off under its own power from a rail and will possibly also use the three-barrel booster originally designed for the Navaho, a B-52 mother aircraft is certainly scheduled to be used for air-launching. In this case the pilot will be sealed in the cockpit from take-off and will not enter his craft in mid-air as he did in the earlier X-1 family. The landing is a more difficult problem. Restricted visibility from the cockpit and the poor handling and lift characteristics at relatively low speeds might well dictate the use of some form of parachute recovery system, and might even imply that a part of the airframe is expended after each flight.

Navigation during the flight might prove sufficiently difficult to require a landing system which could be used anywhere, regardless of ground conditions, the aircraft being tracked during flight and recovered as soon as engineers could reach the place of landing. For conventional landing on the Rogers Dry Lake, where the N.A.C.A. flight testing centre is located, an undercarriage would consist mostly of balancing skids assisting a single mainwheel somewhere slightly aft of the c.g.



M. M. Holladay, an engineer at the Los Angeles Division, adjusts a model—apparently of the X-15—on its sting in the Mach 3.5 tunnel.

HERE AND THERE

Gatwick's Royal Reopening

IT has been announced that the Queen, accompanied by the Duke of Edinburgh, will open the rebuilt Gatwick Airport on June 9.

Alouette Distinction

ON January 14 the Sud-Est Alouette was granted a United States C. of A., thus becoming the first turbine-powered helicopter to receive one.

Trident at 72,000ft

SUD AVIATION claim that a Trident prototype, flown by Roger Carpentier, exceeded the Scorpion Canberra's official height record of 70,310ft last week by reaching 22,000 metres (72,170ft). It took off from Istres test centre.

Piasecki-Bréguet Agreement

AN agreement for "a direct interchange of technical and product information" has been reached by Piasecki Aircraft Corporation and Ateliers d'Aviation Louis Bréguet. It will include the sharing of specific aircraft designs and production techniques and also of research, engineering and testing facilities.

Destroyers at Sculthorpe

THE 47th Bombardment Wing of the U.S. 3rd Air Force, based at Sculthorpe, Norfolk, have taken delivery of their first eight Douglas B-66B Destroyers. All three squadrons will be re-equipped shortly and the old B-45s, the last in service, will be retired. The 19th Tactical Reconnaissance Squadron, also at Sculthorpe, already operates RB-66Bs (*Flight*, March 29, 1957).

Sputnik I End—Official

IN the first official announcement of the end of satellite No. 1 the Soviet news agency Tass reported on Monday, January 20, that the sputnik had "ceased to exist" on January 4 (this probability was reported in *Flight* of January 10). The satellite, launched on October 4, 1957, had been in orbit for 92 days, during which time it completed about 1,400 revolutions of the Earth, equivalent to a distance of about 36 million miles.

Avro Test-pilot Changes

ANNOUNCEMENT of a new chief test pilot for A. V. Roe and Co., Ltd., was made last week-end. He is S/L. J. G. Harrison (portrait above), who joined the company as a test pilot in February 1954 after having served with the R.A.F. since 1935. In 1949 he was runner-up for the McKenna Trophy at the E.T.P.S. and he later joined the Aerodynamics Flight at R.A.E. Farnborough, being awarded the A.F.C. in 1950. The company also announce that W/C. R. J. ("Roly") Falk, superintendent of flying from 1954 to the end of last year, has now relinquished that appointment and taken up one with the Avro sales division at Chadderton.

S/L. J. G. Harrison, whose appointment as Avro chief test pilot is notified on this page.

Helicopter Pioneer

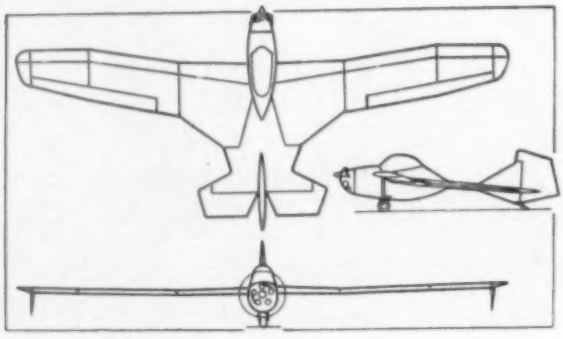
ASSOCIATED with the Sikorsky Aircraft Division of United Aircraft Corporation (and the division's predecessors) since 1924, Serge Eugen Gluhareff died at Stratford, Conn, on January 8. Born in St. Petersburg in 1903, he pioneered with Igor Sikorsky the first successful single-engined amphibious aircraft in the U.S.A. and helped to develop the first Sikorsky helicopter.

High Jump

WORLD Parachuting Championships for 1958 are to be held at Bratislava, Czechoslovakia, during the first fortnight in August. Selection and training of the French team will take place in April and July respectively; no decision has been made as to whether a British team will compete this year.

No S.R.177s for Research

ON Monday this week Saunders-Roe, Ltd., stated that its proposal to build three SR.177s for research and development purposes had been turned down by the Ministry of Supply. The company also said that its original estimate of 1,000 workers redundant by the end of this month had now been reduced to 600 through a reorganization of existing production work.



***POWERED GLIDER** designed by Prof. M. A. Kuzokow of Moscow Air Institute is the MAK-15, which has been in production since 1956. With a span of 35.6ft and length 16.5ft, the machine has a gross weight of 680 lb and a stalling speed of 31 m.p.h.*

Bomarc Training Unit

THE first U.S.A.F. training unit for Bomarc surface-to-air missiles—100 of which have been ordered from the Boeing Airplane Co.—was to be established last week at Eglin A.F.B., Fla.

Pilcher Memorial Lecture

AT the Glasgow Branch of the R.Ae.S. on February 4 the Pilcher Memorial Lecture is being given by Mr. J. L. Edwards, chief engineer of the de Havilland Engine Co., Ltd. He will speak on *Recent Progress in Turbojets and its Effect on Aircraft Design*. (Notice of this lecture was received after the list of forthcoming events on page 120 had gone to press.)

D.H. Propellers Redundancy

IT was stated by de Havilland Propellers, Ltd., on January 17 that their factory at Edmonton in North London is to be closed and that some 400 employees would become redundant in batches, month by month, between now and September.

King Street to Great West Road

WELL KNOWN to the industry as one of the two assistant directors of the Society of British Aircraft Constructors, Mr. R. E. Leete is leaving in order to take up an appointment with the Sperry Gyroscope Co., Ltd., as contracts manager. Mr. Leete, who joined Imperial Airways in 1934, was supplies controller of B.O.A.C. for ten years before joining the S.B.A.C.

Mr. R. E. Leete.

Dutch Wind Tunnel

A NEW high-speed wind tunnel at the Dutch National Aviation Research Institute in Amsterdam is now nearing completion and is expected to be ready for use early this year, when it will be used jointly by several European aircraft manufacturers for research projects.

F.B.I. Publication

ENTITLED *Selected British Technical Journals*, a booklet published at 2s by the Federation of British Industries, 21 Tothill Street, London, S.W.1, provides a comprehensive list of leading periodicals on all aspects of technology, together with brief descriptions of the fields covered.

Quart into Pint Pot

A PREFABRICATED woolshed 60ft long and 30ft wide was recently transported in sections by a single-engined Cessna aircraft (model unspecified) to a remote sheep station in the Marlborough district of New Zealand. All steel, timber and iron involved was made up into 8ft lengths and carried in loads of up to 850 lb.

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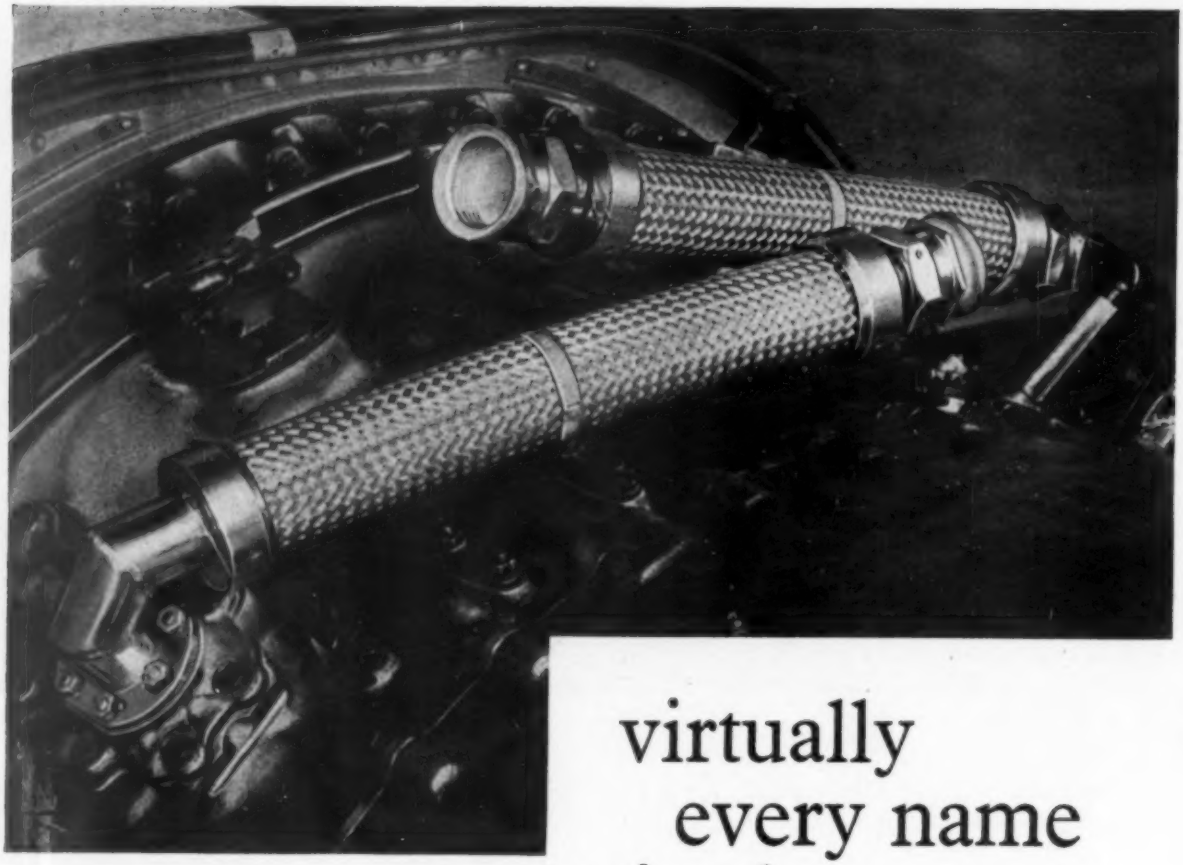

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PAL3

THE AMERICAN INDUSTRY'S YEAR

A Facts-and-figures Review of 1957

A CONCISE summary of the vast picture of America's aircraft and missile manufacturing resources has recently been issued by the Aircraft Industries Association, over the signature of its president, Gen. Orval R. Cook, U.S.A.F. (Retd.). We reproduce it slightly abridged.

THE year 1957 was probably the most extraordinary in the history of the aircraft manufacturing industry. The industry always has been exposed to rapid changes in its levels of activity, in its sales and in its products; but in 1957 these changes came with unprecedented frequency and impact.

As the year commenced, the industry was on a relatively high and stable level of operations which had been in existence for some four years. At the same time, it was reorganizing its work forces and facilities in anticipation of a rather substantial change in the type of products it was manufacturing. Early in the year it had been expected that aircraft production would gradually decline over the next three years and that this decline would be offset by a substantial increase in the deliveries of guided missiles.

By mid-year, as a result of a fiscal crisis in the Federal Government, the orderly programme of transition was scrapped. Through a series of directives from the Defense Department, contracts were stretched out, programmes were cancelled, and severe limitations on overtime, progress payments and other cost items were imposed. These resulted in sharp reductions in employment, cancellation or reduction of work being performed by suppliers and sub-contractors, closing of some plants and sharp curtailment of overtime and various administrative expenses. Simultaneously, the industry was called upon to finance an even greater part of the work it was performing for the Government.

Later in the year, the Russians announced a successful launching of an ICBM and put into the earth's orbit two satellites. There was immediate public reaction and concern over the lack of progress made by the U.S. in these fields, with the result that many of the previously imposed restrictions were removed, and programmes in the fields of guided missiles and space technology were accelerated. At year's end, the detailed impact of these programmes could not be ascertained; however, it appeared that there would be a sharp increase in production of guided missiles and in research and development.

Achievements. During the year the U.S. aircraft industry, which celebrated the tenth anniversary of supersonic flight, continued its advances along a broad technological front in development and production of aircraft and missiles, and stands poised on the threshold of manned space flight.

Today there are 33 announced missile projects under development or in production—ranging from small air-to-air missiles to huge intercontinental ballistic missiles—and the aircraft industry has a major rôle in each project, manufacturing airframes, propulsion units or guidance systems. The missiles projects, by operational category, include: air-to-air, seven projects; air-to-surface, seven; surface-to-air, ten; and surface-to-surface, nineteen.

In addition, there is a supersonic bomber in production and several fighters capable of speeds well beyond Mach 1. Designs for radically new bombers, aimed at speeds in the Mach 3 range and operating altitudes of the order of 75,000ft, were completed and a development award will be made soon.

Production lines have been set up for the new turbojet and propjet commercial transports which will enter service next year. The revolutionary performance these new airliners will bring to air travellers was demonstrated when General Curtis E. LeMay, Air Force Vice-Chief of Staff, flew a jet tanker-transport from Buenos Aires to Washington, D.C., a distance of 5,204 miles, in 11 hr 5 min.

A production Air Force fighter captured the world's speed record, flying a set course at an average speed of 1,207.6 m.p.h., and the same type of aircraft set another record by flying from California to New York and back again non-stop—a distance of 4,838 miles—in 6 hr and 42 min with aerial refuelling from a jet tanker. The first jet non-stop, round-the-world flight was made by a flight of three bombers in 45 hr and 20 min.

Missiles-testing programmes were accelerated with successful firings of intercontinental and intermediate-range ballistic missiles. These are ready to move into volume production.

Sales and Production. Sales were estimated at $11.5 billion (£4,100m)* compared to $9.5 billion (£3,400m) in 1956, despite the facts that employment was reduced from 900,000 at the beginning of the year to 800,000 by the year's end; that there were widespread contract cancellations and cutbacks, both in the activities of the prime contractors and in those of sub-contractors and suppliers; and that some plants were closed.

Notwithstanding record sales figures, production of military aircraft continued to decline from an estimated 6,800 units in 1956 to slightly more than 5,000 in 1957. This was more than offset, however, by increased output of guided missiles and by increased deliveries of commercial aircraft. Commercial sales, for example, for the first time in history topped the two-billion dollar mark (£715m), up more than $500 million (£179m) from 1956.

A significant factor in making the industry's 1957 dollar volume of sales the highest in peace-time history was the influence of inflation. For example, the aircraft materials price index averaged 152.0 compared to 109.2 in 1950; and average hourly earnings were $2.36 (17s) compared to $2.27 (16s 2d) in 1956, even though the average work-week was 40.5 hr in 1957 compared to 42.1 in 1956.

The increased sales of commercial aircraft to both foreign and domestic markets has been reflected in the percentage of the industry's efforts devoted to military output. In 1955, deliveries to the military represented 89 per cent of the industry's total sales; in 1956 such sales represented 85 per cent of the total; and during 1957 the figure was 82 per cent. Sales of the twelve largest airframe manufacturers paralleled those of industry as a whole, setting a new high of about $6.5 billion (£2,320m) compared to $5.6 billion (£2,000m) in 1956.

Although there was a decline in the number of commercial aircraft delivered during 1957—an estimated 6,850 units compared to 7,205 in 1956—there was a sharp increase in the dollar value of commercial deliveries, which are estimated at $725 million (£260m) for 1957, as against $454 million (£162m) in 1956. Most of this increase is due to the fact that airline transport deliveries are estimated at some 325 units compared to 206 during 1956.

It is estimated that 1957 utility-aircraft deliveries will be of the order of 6,200 units compared to 6,778 in 1956, although dollar value of sales will continue to be on approximately the same level as the 1956 figure of $100 million (£35,600,000).

Earnings. The impact of contract stretch-outs and cancellations and the other economic restrictions placed on the industry, while not significantly affecting sales, had a material effect on earnings. For example, during the first nine months, the twelve major airframe companies reported an increase in sales of more than a billion dollars from a 1956 figure of $3.8 to $4.9 billion (£1,360m to £1,750m), while earnings increased from $112.6 million to $120.1 million (£40,400,000 to £43,100,000) for the same periods. During 1956, the ratio of earnings to sales for the first nine months was 2.9 per cent while the comparable 1957 figure was only 2.4 per cent. Because the unusual changes in military orders and programmes are expected to have a significant affect on fourth-quarter figures, it is impossible to forecast accurately the complete year's earnings. Yet it is safe to assume that the year's ratio will not be improved over the nine month rate.

Backlog. The backlog of unfilled orders at the end of the third quarter totalled $14.4 billion (£5,150m) compared to $18.4 billion (£6,580m) for the same period in 1956. Of the 1957 total, approximately $3.8 billion (£1,360m), or 36† per cent, was represented by commercial orders. Unfilled orders for jet and propjet transports continued to increase with 508 units valued at more than $2.8 billion (£1,000m) on the manufacturers' books as of October 31, 1957. The total transport backlog at that time was 695 units compared to 878 for the comparable period in 1956. Details were:—

October 31, 1957		October 31, 1956	
	units		*units*
Turbine,	508	Turbine,	427
Piston,	197	Piston,	451
	695†		878

Employment. Employment in the aircraft industry averaged 880,000 workers—substantially higher than the 1956 average of 814,000. During the first six months of the year, average employment was some 900,000; since that time, however, each month has seen a continuing decline in employment and it is anticipated that the year end total will be in the vicinity of 800,000.

Despite a sharp curtailment in overtime payments, aircraft employees' 1957 average weekly earnings of $97.00 (£34 12s) were higher than the 1956 weekly average of $95.57 (£34).

**The American billion is a thousand million.*

†According to our calculations, this figure should be 26.4 per cent. The total in the current backlog table does not agree with the units added, and it was not possible to trace where the A.I.A. miscalculated at the time of going to Press.

BOOSTING HELICOPTER TURBINES

Four Schemes for Emergency Applications Suggested by a Napier Engineer

A FAR-SIGHTED survey of the various means by which an emergency increase in the power output of gas turbines in helicopters could be obtained was presented to a meeting of the Helicopter Association in London on January 10. The lecturer was Dr. A. W. Morley, Ph.D., of D. Napier and Son, Ltd., and his paper was entitled *Boost Systems for Helicopter Gas Turbines*. Chairman of the meeting was W/C. R. A. C. Brie, one of the Association's two vice-presidents.

Dr. Morley began by outlining four principal methods which could be employed. These were (a) the rocket-on-rotor system, (b) the burning of additional fuel before or at the blade tip nozzles in configurations which used a jet drive to the rotor tips, (c) short-period increases in main turbine power output where a mechanical drive to the rotor was used and (d) the use of an auxiliary turbine which could be brought into use when required. He also described a composite turbine, using both mechanical drive and pressure jets at the blade tips, which offered promise for the future.

The basic requirement differed for single- and twin-engined machines. In the former case, the main interest was to provide an improved performance for take-off and landing to enable the helicopter to carry greater payloads. In the latter case, the need was to boost the power of the remaining engine should one of the pair fail in flight. The cruising condition was not critical, because the power requirements to maintain height were reasonable; but if it was necessary to maintain height in hovering flight, and to climb away on one engine, a severe penalty was imposed on the machine unless emergency means of boosting power could be used.

The application of the rocket-on-rotor system to the Skeeter helicopter, using "cold" hydrogen-peroxide rocket motors, was well known. The H.T.P. was carried in a tank above the rotor head and taken to the blade-tip decomposition chambers under the influence of centrifugal force. The pressure so induced in the blade conduits was appreciably greater than was necessary and had to be reduced by means of restrictors at the root ends. These restrictor units also incorporated the on-off valves operated by a switch on the pilot's control column. Response was of the order of one second. The system provided an additional 90 h.p. in the Skeeter, allowing some 900 lb to be added to the take-off weight, or equivalent improved performance.

It was possible to envisage a future development of this system, using "hot" peroxide rocket motors in which main-engine fuel (for example, kerosine), could be burned at the rotor tips with the peroxide. This system would produce approximately twice the power of the "cold" peroxide rockets, but the improved performance would be offset slightly by increased weight of the blade-tip chambers. These would need to include burner heads and a cooling system to keep the chamber wall temperatures within practical limits. While possessing great attraction, the "hot" system would probably be worth while only in larger tip-thrust units, because of its additional complexities.

The lecturer went on to discuss the various forms of jet-driven rotor as a means of boosting power and showed that in the majority of cases the pressure jet was the superior type. When considered as a method of emergency boosting, a powerplant capable of supplying a considerable air bleed at short notice was required. Special ignition equipment and an automatic linkage arrangement would also be needed so that the extra rotor horsepower could be available at a moment's notice. Where the tip-jet drive was used as the main source of rotor propulsion, emergency power ratings could be obtained by means of afterburning at the nozzles.

One of the advantages of using tip-jet boost as an emergency source of power was that no additional load was placed on the transmission, rotor hub and blades. In fact, the boost at the tip had the effect of unloading the rotor drive. Further, no undesirable sudden torque loads would be introduced nor would any proportion of the emergency power have to be used to counteract torque. If a direct increase in the main turbine engine power was used in a twin-engined helicopter, an automatic safety system had to be incorporated whereby the additional power could not be applied to the transmission system while the normal power from both engines was being used. Only when one engine had failed could the emergency power from the remaining engine be used. Boosting of the main powerplant for a short-period emergency rating was best applied in the free-shaft turbine, where the compressor temperature could be increased without affecting the speed of the free turbine. Some means of cooling the compressor turbine during the emergency period would be necessary, probably in the form of a liquid coolant spray. It had been predicted that by limiting the temperature gain to 200 deg C a 60 per cent increase in power could be obtained.

The use of a composite scheme, in which the normal power was supplied by mechanical drive and emergency power by bleeding air from the compressor turbine to blade-tip nozzles, offered a number of advantages, particularly with regard to the problems of overloading the transmission and of anti-torque. The additional fuel burned in the compressor would be bled off in the form of compressed air before the free-turbine stage and so would not affect the load on the rotor hub. More fuel could be burned with the compressed air at the blade tips. An examination of the possibilities of such a system in relation to the Gazelle engine had shown that the emergency power available from the air bleed would, in practice, be somewhat less than could be obtained if the same turbine temperature were used with normal mechanical drive and overspeed; and the indications were that, to gain the greatest advantages from the system, a powerplant would have to be designed with this specific type of operation in mind.

Dr. Morley concluded by outlining the possibilities of carrying a third auxiliary turbine engine in the helicopter, connected *via* a freewheel to the main rotor drive in such a way that it could augment the power from the main engines in emergency. To carry the third engine as a "passenger" under normal conditions was not in fact such an undesirable complication as might at first appear, provided that an engine of proved design and suitable size for any particular project already existed. In its favour would be the similarity of its handling characteristics to those of the main powerplants, and good fuel economy. He thought it probable that the auxiliary turbine would also be used to boost power at take off in a twin-engined machine, since it would have to be started and run up prior to take off in any case so that it would be ready for emergency use. To meet a typical case, where the minimum flight power was 0.625 of the take-off power, the auxiliary would need at least two-thirds of the power of the main engine.

Of all the systems described, the rocket-on-rotor probably had the greatest power potential and called for the minimum of modifications to the existing powerplant and airframe. The straightforward up-rating of the main powerplant had the advantage of low specific fuel consumption, while the use of an auxiliary showed a slightly shorter endurance. The composite gas turbine and pressure-jet solution appeared to have an endurance intermediate between the rocket-on-rotor and the up-rated turbine.

POINTS FROM THE DISCUSSION

DR. E. S. MOULT (de Havilland) congratulated the lecturer on his paper and asked whether it was envisaged that an up-rated turbine would have to be rejected after such an emergency use or, perhaps, be restricted to a limited number of emergency boostings before major overhaul. He also asked what was the extent of the problem involved in quickly lighting the jet tips for emergency use, and whether any undue out-of-balance effect occurred in the rotor if one failed to light.

MR. A. STEPAN (Fairey Aviation) said that the problem of lighting pressure jets was not particularly critical and had been solved satisfactorily in the Gyrodyne and Rotodyne. If one tip flame went out, a slight vibration did result, but it was not excessive—more air was then expelled through the cold nozzle, thereby reducing the pressure to the others and tending to equalize individual blade-tip thrust.

MR. T. L. CIASTULA (Saunders-Roe) confirmed that from his own experience the vibration caused by the failure of one tip jet was not severe.

MR. D. L. HOLLIS WILLIAMS (Westland Aircraft) said that he felt the rocket-on-rotor system deserved a wider utilization but the Services did not appear to want the complications of the special fuel on military operations; they preferred to boost the main engine. In a helicopter using fixed-shaft turbines as the main powerplants an auxiliary free turbine could also serve a useful purpose in starting the rotor and so easing the clutching problem considerably.

MR. G. NEWBERY (M.o.S.) asked whether it would be worth while attempting to use reheat at the blade tips, since there would be a weight penalty caused by the extension to the nozzle "tailpipe" exit.

DR. H. ROBERTS (Fairey Aviation) thought the pulsejet should not be entirely ignored. If the intake were arranged at 50 per cent of the blade radius with the exit at the tip a useful result could be obtained. Regarding the possibility of using an auxiliary turbine, he said that a case could be made for a "two-and-a-half-engined" helicopter, but he felt that the mixed maintenance problems would not be easy to overcome. He felt that the composite mechanical drive and pressure-jet proposal would be difficult from an engineering point of view, because the optimum requirements for a shaft-driven rotor could not easily be related to those for a jet-driven rotor. One might lose the best characteristics of both.

DR. MORLEY, in reply to the discussion, said that, from the work they had done, it appeared that they would be able to reach an increase of between 25 and 30 per cent of power by boosting the compressor turbine and they hoped to pass a type test at this figure. Therefore there should be no need for rejecting the engine after emergency use. He thought that the jet conduits for an emergency blade-tip drive could be accommodated satisfactorily within the blade without unduly affecting its contour. The "half engine" was just a little too small to meet the emergency requirement under the worst conditions.

OCEAN, ICE AND ROTORS

Antarctica and the helicopter are pictured on this page. Above, the vivid design of cracks across an ice-floe, on which a helicopter casts its shadow. Below, right, the same machine, an H04S of the U.S. Navy, lands on ice-breaker U.S.S. "Glacier" near McMurdo Sound. Thirty-five miles away, at Cape Bernacchi, an HSS-1 (below, left) alights on what may become Antarctica's first permanent airport, in the course of a survey of the suitability of the site.

AERONAUTICAL BOOKSHELF

Evidence in Camera, by Constance Babington Smith. Chatto and Windus, Ltd., 40-42 William IV Street, London W.C.2. Illustrated. Price 18s.

CLOAK-AND-DAGGER activities are popularly thought to be confined to neutral capitals, enemy territory and, very occasionally, to our own Services and Ministries. But just before the last war, one of the most daring cloak-and-dagger operations was carried on, for nearly a year, 20,000ft over Germany, Italy and the then Italian Empire. A single Lockheed 12A, painted a gay duck-egg blue (which, incidentally, made it difficult to spot from the ground) was the cloak, and the daggers were its three cameras, which went clicking away over much of Europe and parts of Africa. The men behind this venture, which had the blessing of the Chief of the Air Staff of those days, Sir Cyril Newall, but was "strictly on a civilian footing," were Frederick Winterbotham and Sidney Cotton. Their legalized trespassing was done nearly 20 years ago; now their names are all but forgotten, but their story is one of the finest in *Evidence in Camera.*

Another concerns the author herself and her discovery of the V.1 on a photograph of part of Peenemunde. The flying bomb looked, to the untrained eye, to be an insignificant blur on the picture. But she had specialized in aircraft recognition, and the tiny winged craft did not escape her. Quickly the strange "ski sites" along the enemy's Channel coast were linked by our intelligence with the tiny aeroplane at Peenemunde, with the result that when the first V.1 landed on June 13, 1944, we knew a great deal and our defences were organized—if not ready.

Photographic reconnaissance became a science between 1939 and 1945. The job was not done entirely by the aircrews, or by the painstaking photographic interpreters, of whom Miss Smith was one, but by the two working together and passing the results of their work on to Service commanders who had quickly learned its value. From minute scale photographs was gleaned information which even the most wily agent could not obtain, or details of how successful or hopeless a bombing attack had been. One such failure proved by photographs was the raid on the seaplane base at Sylt on March 19, 1940, heralded as the R.A.F.'s revenge for the German bombing of Scapa Flow. The interpreters learned, too, to recognize the "normal" look of the enemy's lairs, so that as soon as something unusual began to happen it was spotted and, usually, its significance established.

Miss Babington Smith's story is not a dull record—if it were a novel it would be hailed as a thriller, for the task which the P.R. units had to do was a masterly and vital piece of detective work.

A. C. B.

Jane's All The World's Aircraft 1957-58, compiled and edited by Leonard Bridgman; assistant compiler, John W. R. Taylor. Sampson Low, Marston and Co., Ltd., 25 Gilbert Street, London W.1. Illustrated. Price £5 5s.

THIS year's "Jane's" is, as usual, impeccable. Now 48 years old, this best known of aircraft reference books still stands head and shoulders above its competitors and imitators. Mr. Bridgman and Mr. Taylor do not attempt to make it a sensational publication, only an incredibly useful one. It is full of facts, and if one can find any argument with it at all, it is that occasionally the details are slightly out of date. This is inevitable in an annual issue, but the missing items are nearly always minor ones, and do not in any way detract from the accuracy of the details which are given. The reputation of the book is such that executives of the aircraft industry rely upon it implicitly. Knowing this, the compilers have an unenviable task in keeping up the high standard by sorting out the facts from the opinions which they receive from a publicity-minded industry. How well they do it.

The book is larger than last year, the text is entirely revised and there are nearly 600 new illustrations. The index refers to every aircraft and engine described in the last ten editions—invaluable to anyone fortunate enough to have a shelf full of back issues. The Guided Missile and Test Vehicle section is larger than last year and, although necessarily short of information, is a good survey of the work in six countries, unfortunately (but understandably) excluding the Soviet Union.

A. C. B.

Flight Overseas, by Henry B. Lent. The MacMillan Company, 10 South Audley Street, London W.1, and New York. Illustrated. Price 21s.

WE may, some of us, have become a trifle blasé about airline flying, and especially about the crews, the maintenance and training organizations, and the navigation aids which cover practically every route in the world. In *Flight Overseas* all of these are put under a bright spotlight to make a book which would be a good present for those very many people who either take airline flying as a matter of routine, with never a thought for the behind-the-scenes organization, or who still think an aeroplane to be an invention of the Devil, and vow never to board one.

The drawback is that the book is inspired, perhaps even promoted, by a smart public-relations officer, and there is the consequent danger that an unenlightened reader may think that there is only one airline in the whole world—the one which paints its Constellations white and prints its initials even on tip tanks, lest they get lost.

R. O.

Constance Babington Smith, whose book, "Evidence in Camera," is reviewed on this page. Miss Babington Smith tells how war-time Photographic Intelligence worked and what it achieved. In recognition of her work she was Mentioned in Dispatches, appointed M.B.E., and awarded the U.S. Legion of Honour.

Wings of Youth, by Leonard Taylor. Rolls House Publishing Co., Ltd., 2 Breams Buildings, London E.C.4. Price 12s 6d.

POETRY can bring an almost ethereal and often poignant quality to any subject, and flying lends itself invitingly to the poet. In this collection there are new and old verses which may contain some half-remembered lines we have read before, and which most certainly will entertain with its newer compositions. Although not all the poems are about flying, those that are show how futile, how wonderful, how serious and how humorous it can all be. They are all written by Leonard Taylor's whimsical pen, which can be cynical and humorous at the same time, as in these lines from the cumbersomely titled *The Flying Club's Annual Display*:—

And finally towards the end
A parachutist will descend.
But as such falls are always hard
And consequently sometimes marred
By accidents, no gentle men
Can do them. We are lucky then
To find a girl prepared to fall
To please and edify us all.
Her sex, if fates should be so willing
Would make an accident more thrilling
For some, though not of course for all.
As is their wont when ladies fall
For either grace or aeroplanes
And break their ankles, hearts or brains,
The gentle men will turn away
And hope the club won't have to pay.

R. C. C.

Nature is Your Guide, by Harold Gatty. Collins, St. James's Place, London. Illustrated. Price 16s.

AN unusual subject is here dealt with in a fascinating manner—albeit with a touch of repetition—by the late Harold Gatty. His book has nothing to do with health cures, nudity or vegetable juices.

It will be remembered that Gatty, Tasmanian-born, was navigator to Wiley Post in the Lockheed Vega *Winnie Mae,* on his remarkable round-the-world-in-eight-days' flight in 1931. At that time, assuming you could fly, two things primarily affected your chances of arrival at destination: an engine that kept fanning and a navigator who kept planning. Navaids as we know them today were sparse and unreliable

Gatty had several other distinguished connections with aviation.

In Los Angeles he opened and operated a navigation school. He was in charge of navigation research and training for the U.S. Army Air Corps in the early thirties and was awarded an American D.F.C. In the Second World War he served in the R.A.A.F., with the rank of group captain, as Director of Air Transport for the Allied air forces in Java, Australia and New Guinea. With Pan American he pioneered the first trans-Pacific air route and he compiled a survival handbook for the American Services. Until his recent death, he had been in the Fiji Isles, where he established and operated Fiji Airways.

The book comprises a record of a lifetime of observation of the signs which nature provides of direction and position on the earth's surface. With Gatty's knowledge one would have a fair chance of finding one's way on land or sea anywhere on the earth's surface without instrument or the help of others.

He is adamant that Man has no natural sense of direction. Though greatly admiring Thor Heyerdahl's *Kon-Tiki* expedition, he disagrees with Heyerdahl's basic theory. His observations of migratory bird flight across vast expanses of the Pacific Ocean had confirmed much of what he had already learned among the peoples of the Polynesian Islands of their ability to navigate by natural observation. In their catamarans they probably followed the island-to-island flight of birds, centuries before Columbus and Vasco da Gama ventured on the oceans. M. A. S.

Loftleidir

AN ICELANDIC AIRLINE'S EXPERIENCE OF LOW-FARE TRANSATLANTIC TRAVEL

By K. WESTCOTT JONES

AN increase of 25 per cent in the numbers of passengers carried has been recorded by the only non-I.A.T.A. airline operating services from Europe to North America in the past year. Much of this gain is undoubtedly due to Loftleidir Icelandic Airlines' extension to London and Luxembourg.

Loftleidir set out to capture a certain type of market that was being overlooked by the major North Atlantic operators. As far as I could tell after making a number of transatlantic flights with this airline, they have succeeded. Their aim was to sell air transportation to people who have to pay for the ticket out of their own pockets, instead of from expense-accounts, and whose visit to America was expected to be of relatively long duration—from two weeks upwards.

The granting of a dollar allowance by the British Treasury late last summer was of immense importance to Loftleidir, but it was necessary to establish that the sum permitted to be spent in America (280 dollars per person) was adequate to meet the reasonable needs of tourists and semi-tourists for three weeks or more. The company was not in competition with the 15-day winter tourist returns offered by I.A.T.A. companies and, in order to gain the benefit of the large reductions in fare given on the Icelandic route, it was essential that persons should be able to afford a longer stay in America than a fortnight. By careful investigations, aided by such bodies as the New York Visitors and Convention Bureau, this has been clearly established. In fact, I have proved it for myself, and shown that a British couple can stay at least 21 days in the heart of Manhattan without scrimping, at a good average hotel, at a combined cost of 25 dollars a day, including food and reasonable entertainment.

It is only on the Reykjavik - New York sector that Loftleidir shows such a substantial reduction of fare; the rates charged from London, Hamburg, Glasgow, Copenhagen and other European centres to Reykjavik are in line with I.A.T.A. fares. It is significant, though, that I.A.T.A. defended itself at an Anti-Trust Law hearing in Washington by citing the fact that Loftleidir Icelandic Airlines were being permitted to fly the Atlantic and enter New York on a fare structure much lower than the standard one.

Loftleidir has been flying between Iceland and the United States since 1948, and has now reached a point where its intercontinental traffic averages more than 2,000 passengers a month. All 700 of its stockholders are Icelandic citizens; it is the only entirely privately owned, non-subsidized airline on the North Atlantic and, according to statistics, it takes its place as the third long-range carrier in the world by virtue of the fact that each passenger flies an average of 4,500 km.

Apart from genuine tourists, the type of passenger includes university professors and their wives undertaking study tours from both sides of the Atlantic; schoolmasters; clergy on exchange visits; librarians on similar missions; and students. During my return flight I discovered that no passenger on either well-loaded aircraft had an expense account. None, in fact, were businessmen, but all were persons to whom the saving on existing I.A.T.A. fares was more important than the loss of eight hours on the journey. Most of them would have crossed by sea if the inexpensive air route *via* Iceland had not existed.

Operating four DC-4s, three under Icelandic registration and one Norwegian (on permanent charter from Braathens), the company provides exceptional leg-room, a high standard of cold buffet meals, and—during the Reykjavik - New York section of the flight—free cognac. Seating is arranged to accommodate 54 persons, five abreast. Weight is reduced by the removal of fresh-water tanks, although this is not a particularly popular measure. Special enveloped wet packs are provided for washing.

At present, on winter schedules, the London to New York Loftleidir departure is at noon on Wednesdays. The aircraft calls at Glasgow (Renfrew) between 1400 hr and 1500 hr, then at Reykjavik, where dinner is served in the airport restaurant. Quite often the Reykjavik to New York stretch is flown without an intermediate stop in the westbound direction, and occasionally eastbound; otherwise, Goose Bay is the chosen call. On my westbound journey, in mid-October, Goose Bay was overflown to provide an early arrival at Idlewild. Normally the aircraft is scheduled to arrive at 0800, but we landed at 0720.

Loftleidir were posed a major problem last November when I.A.T.A. finally agreed to introduce "economy-class" fares across the North Atlantic as from April 1958. The new London to New York single fare will be £90, £3 less than that offered by Loftleidir. The Icelandic carrier has countered by cutting fares slightly below the I.A.T.A. level without altering standards of service. This fare reduction is expected to be more than covered by an increase in traffic. Additional aircraft, possibly from the DC-6 fleet that C.P.A. are replacing with Britannias, are being sought to provide extra capacity.

Loftleidir, operating four DC-4s from London and Prestwick to New York via Iceland, pioneered third-class transatlantic fares.

Improving Commutator Performance

USES OF THE RHODIUM-PLATING PROCESS IN AIRCRAFT ELECTRICAL EQUIPMENT

ELECTRICAL machinery has frequently been limited in performance by poor commutation; and this has been particularly critical in modern aircraft. Reduced operating current, lower brush wear and temperatures, increased life and less radio interference are among the advantages claimed for the rhodium-plating process described here. The matter is of particular interest in the light of the opinions expressed on pp. 116-117.

THE main cause of commutator inefficiency is the copper-oxide film which forms on the working contact face. This film can form during storage and certainly does so during operation of the motor or generator. Copper oxide not only has a high specific resistance, creating heat-developing wattage loss, but is continuously formed at raised temperatures from the inside face of the oxide film. This oxide film breaks away from the commutator in small particles, arcing occurs, and electrical noise and radio interference result.

A practical solution of the problem is to deposit on the copper commutator a film of non-oxidizing metal. This film must be hard wearing, have a low coefficient of friction and must be non-porous, so that oxidization of the copper below the film cannot occur. The protective film must be deposited after the armature/commutator assembly has been balanced and all work completed.

Rhodium has a low electrical resistance, is non-oxidizing, and has a hardness of 500/600 Brinell and a coefficient of friction much lower than that of copper oxide. It is therefore a most suitable material to be used for this purpose. Rhodium can be deposited by bath techniques, but plating of a complete, wound commutator/armature assembly presents obvious difficulties. A method of avoiding them is the use of the technique known as the Dalic process of localized electrodeposition (Metachemical Processes, Ltd., Crawley, Sussex).

The process requires equipment comprising a powerpack giving a D.C. output, a type of brush anode or stylus and special solutions carrying the metals it is required to deposit. No immersion in solutions is necessary, the process is rapid, and it can be controlled within extremely fine limits. The negative lead from the power pack is connected to the work-piece and the positive lead to the brush anode or stylus. The stylus is formed with an absorbent material, dipped in the plating solution and brushed over the area to be plated.

The deposit is stated to have excellent adhesion to the base metal and to be non-porous. Its thickness depends upon plating time and current, which is indicated precisely by a finely graduated ampere-hour meter on the power pack. Deposits of any reasonable thickness may be obtained with an accuracy of ± 5 per cent.

The weight/power ratio of electric motors used in aircraft is almost always an important factor; but quite frequently, because of commutator impotencies, motors and generators have to be de-rated, with a consequent weight/power ratio increase. In one particular instance, the electric fuel-pump motor on a famous intercepter aircraft was subject to delays in manufacture, owing to difficulties in obtaining the required fuel delivery with the maximum current ordained; the working temperature was high, brush wear excessive, contact resistance was high and commutator life extremely short. After a fully loaded run of some 120-130 hours, commutator wear was noticeable and, owing to the rapid formation of a copper-oxide film, the current required to drive the motor was very high. Similar commutators were rhodium-plated by Dalic to a thickness of 0.00005in and put on test pumps for trial. Vast improvements in commutation were noted at once. As indicated in the table below, the rhodium plating gave the required pump performance with a lower current than that previously obtained and the current drain on the batteries was reduced by some 12 to 13 per cent. After over 600 hours' operation, it is stated, the current required was still at the lower figure, no loss of rhodium was observed and the working face of the commutator remained unchanged. Temperature of the rhodium-plated commutators was much lower than that of the unplated examples, and brush wear was negligible.

		Current (amp)	
		Normal r.p.m.	High r.p.m.
Pump No. 1	Unplated	15.6	25.9
	Plated	15.0	22.8
Pump No. 2	Unplated	16.8	26.0
	Plated	15.5	22.8
Pump No. 3	Unplated	15.3	26.0
	Plated	15.5	23.5
Pump No. 4	Plated	16.0	23.6

In another instance a rotary convertor on an airliner caused heavy radio interference after some 300 hours' operation. When the commutator had been rhodium plated no further interference occurred, even after some 2,000 hours' operation. It was considered that the commutator would still operate in a static-free condition after several thousand hours.

To ensure that no damage could occur to commutator insulations through being in contact with Dalic solutions, certain tests were carried out. Two commutators were rhodium-plated and the plating solution left on one of them, while the other was swilled in clean water. After some three months the commutators were examined for corrosion. Staining was apparent, but was easily removed; no corrosion occurred, and the insulation value was not reduced.

The value of the Dalic rhodium deposit on commutators is not, of course, limited to motors deriving their power from batteries, but it would appear that in this field lie the more urgent and immediate applications. Development work is continuing, with the particular objective of the elimination of electrical noise on many aircraft components without the use of suppressors.

SEATS FOR BRITANNIA 253

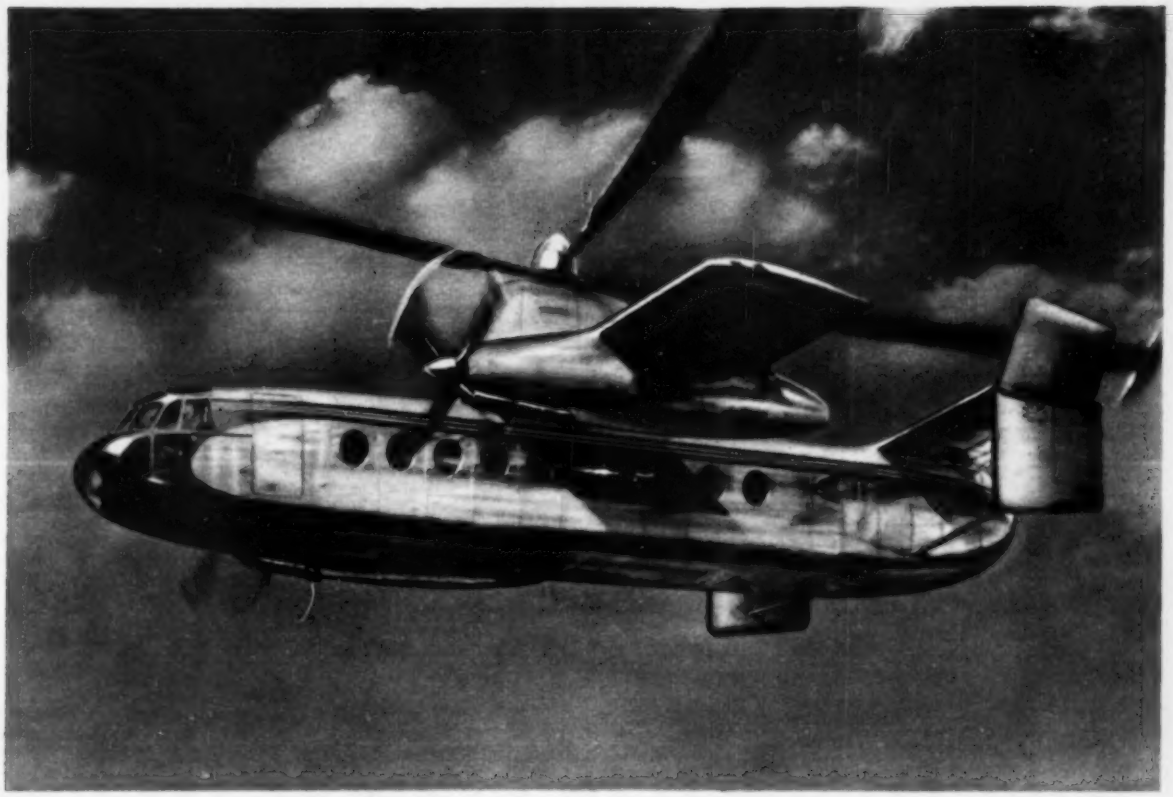
SHOWN here in prototype form with three alternative types of upholstery is the lightweight seating, designed and built by Short Bros. and Harland, Ltd., which is to be installed in the Bristol Britannia 253s which the Belfast firm is building. The backs and legs are detachable for stowage and the units can be installed either port or starboard.

High-density seating, either forward- or aft-facing, can be provided without loss of comfort because the reclining back can be adjusted while the seat-cushion remains fixed, thus maintaining adequate leg-room.

Officially specified safety-features include leather "ears" on the headrests to keep the occupant's head in position in the event of a forced landing, and a heel-restraint system to prevent ankle injuries.

The seat, which is designed to withstand loads of up to 9g, is built almost entirely of pressed light-alloy section. Upholstery is in foam plastic, with dark blue hide covering and metal protective fittings. Normally positioned at 12 deg, the back can be adjusted through a further 32 deg in eight stages. The table, when not in use, is stowed in a pocket attached to the back of the seat.

The seats to be produced for the Britannia 253 comprise 1,350 passenger places, made up of 60 double and 410 triple units. They are being made at Short's general engineering division at Newtownards, near Belfast, where seats for B.E.A. Viscounts are already in production. The latter seat, for the V.802 and V.806, was illustrated in our issue of September 21, 1956.



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BRISTOL 200
—a Preliminary Appraisal

ON page 98 is discussed the background to the Bristol-Hawker Siddeley decision to release details of the Bristol 200 short-range jet airliner. The general arrangement, shown right, provides no surprises: the engine layout—assuming that the three-engine formula proves acceptable to the market—is the best symmetrical solution.

There appears to be no drooping leading-edge, though the advantages of this installation were no doubt carefully weighed. Three-section flaps, unobstructed by engines, extend between ailerons and wing-roots, and give the high take-off lift coefficient which—with the exceptional power/weight ratio of about 0.33—provide the required field performance. The B.E.A. field-length requirement, which the 200 no doubt fulfils, is 6,000ft.

A surprise is provided by the higher-than-expected gross weight of 120,000 lb: this is more than the 100,000 lb category in which the short-range jet has hitherto been classed. Evidently Bristol found that, without penalizing the critical short-range economics of this kind of aeroplane, they could add more tankage to extend the range and, *ipso facto*, the export market (B.E.A.'s requirement was a 1,000-mile maximum-payload stage). In fact, the quoted range with 100 passengers (the Bristol 200's maximum seating capacity) is 300 to 1,700 st.m. Capacity payload is quoted as 21,000 lb.

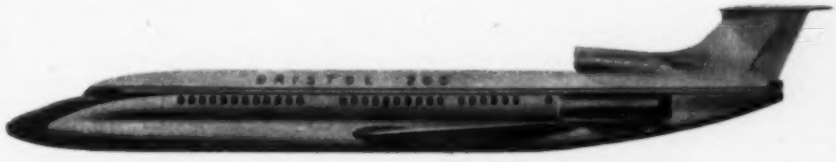
The double-bubble fuselage provides, for a given frontal area and structure weight, maximum passenger-floor width and large freight-hold capacity. The latter is provided in conformity with the requirement—resulting from traffic-peak economics—for high payload regardless of the passenger traffic offering. The close spacing of the windows, to provide for flexibility of seat pitching, and the positioning of both passenger doors forward of the wing, are noteworthy points. Cruising speed is quoted as "in excess of 600 m.p.h."

No mention is made of the type of engine which is being offered to the export market: during the discussions with B.E.A., it was stated that the Corporation's preference was for a Rolls-Royce engine (presumably the R.B.141 by-pass turbojet). The obvious alternative powerplant, and one which is virtually in production, is the Bristol Olympus 553, a variant of which is marketed as the Zephyr by Curtiss-Wright in America.

The Bristol 200 represents a new class of transport aeroplane. Should Bristol and Hawker Siddeley decide to proceed with its construction, this powerful sponsorship should be well-placed to meet a demand for short-range jets which—notwithstanding the turboprop's short-range advantages—is likely to materialize in the sixties.

BRISTOL 200
(Three turbojets in the 13,000 lb class)

Span	91ft
Length	121ft 6in



Fiat's New Helicopter

Notes on the 7002 and its Powerplant

NOW under construction at Turin, the Fiat 7002 medium-size, general-purpose helicopter promises to give a ratio of empty weight to useful load of 1 : 1.33. The main rotor is driven by compressed-air jets at the blade tips, supplied from a specially developed turbo-generator.

This type of "cold jet" propulsion was chosen by Fiat on the grounds of lightness, constructional simplicity, low initial cost, high reliability, long overhaul life, and low maintenance and operating costs. The compressed air is supplied by a Fiat 4700 turbo-generator in which the turbine-driven air compressor is operated by a primary hot-gas generator based on the Fiat 4002 turbojet.

The air compressor and the primary engine are mechanically independent, resulting in free-turbine advantages and permitting the optimum compression ratio for the best pneumatic transmission efficiency to be selected. The absence of reaction torque would have allowed the abolition of the tail rotor, since directional control could be obtained by means of a rudder. In order to ensure complete manœuvrability at low forward speeds and in vertical autorotation, however, a small ducted tail rotor, mechanically driven by the main rotor, is employed.

In general construction as well as in structure, the machine is based on the concept of flexibility for a number of military and civil applications. The two main-rotor blades have leading edges and spars made from stainless steel welded sheets and incorporating air ducts to the tips. The rotor hub is of the tilting type, the blades being connected by steel strips which bear centrifugal loads and permit blade-pitch variations.

Constructed from light-alloy sheet, the fuselage consists of three main sections which house respectively the cockpit, the main cabin, and the vertically mounted powerplant. A short tail beam carries the ducted tail rotor and a tailplane. The upper portion of the fuselage centre-section embodies the attachments of the main rotor hub, and the fuel tanks. The landing gear is of the skid type.

Normal loads envisaged for the 7002 are (1) one pilot and six passengers, (2) one pilot, one assistant and two stretchers (two additional stretcher litters can be mounted externally), and (3) one pilot and 90 cu ft of freight. Adaptation for other specialized purposes such as rescue or agricultural work is possible, and full dual control is fitted.

Specially developed for use in a cold-jet drive helicopter, the 4700 compressed-air generator is of the free-turbine type, having a prime mover consisting of compressor, combustor and turbine which generates gas to be fed to a further power turbine. Thus latter turbine drives the power air compressor. Vertical mounting of the engine reduces the length of the compressed-air duct to the rotor.

In the primary engine, air suction is of the updraft type through an air-intake casting made of magnesium-zirconium light alloy. The rotating unit, supported at the lower end upstream of the compressor by a ball thrust bearing and at the upper end by a roller bearing, is pneumatically balanced in order to reduce the axial thrusts on the bearings.

The mixed-flow combustion chamber has a high specific capacity, with reduced overall area and weight. High-altitude operating characteristics are good, and the simplicity of design and small number of parts have resulted in high efficiency and simple accessibility.

An axial-flow, alloy steel turbine is employed, with high-nickel alloy turbine blades. The rear bearing and the turbine are cooled by air bled from the compressor.

The free-turbine compressor is a self-contained unit connected to the primary engine through a flange and sheet-metal structure. Provision is made in the connection of the two units for thermal distortions without any adverse effect on their operation. Primary engine and compressor do not need to be accurately lined up during assembly, with consequent speed and simplicity of stripping and reassembly in maintenance and servicing.

The axial-flow, single-stage turbine is made of alloy steel, with fabricated high-nickel blades. The compressor is fitted with a magnesium alloy fabricated impeller. Compressor-diffuser frame and air manifold consist of a single magnesium-zirconium casting. The rotor main bearings are accommodated in an internal housing attached to the compressor-diffuser frame.

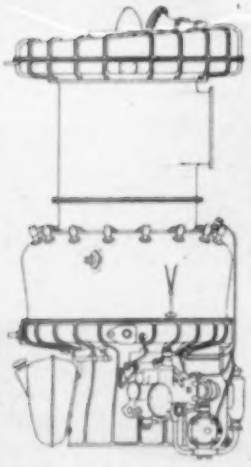
Air for the power compressor is downdrafted through an air intake, and the power air supply is fed through a scroll on the upper end of the unit. The exhaust manifold is annular and deflects the exhaust gas through 90 deg, so that it flows parallel to the longitudinal axis of the helicopter. The remaining thrust is thus available for forward movement.

FIAT 7002 HELICOPTER (FIAT 4700 TURBO-GENERATOR)
Dimensions and Performance Data

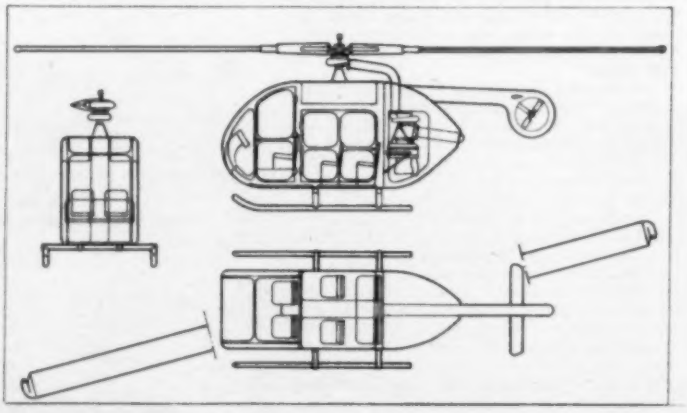
Rotor diameter, 39.4ft; blade chord, 1.4ft; fuselage length, 20.1ft; fuselage width, 4.6ft; fuselage height, 6.2ft; maximum height, 9.4ft; fuel capacity, 125.5 Imp. gal.; normal gross weight, 3,085 lb; empty weight, 1,320 lb; useful load, 1,765 lb.

Estimated performance: maximum speed, 106 m.p.h.; cruising speed, 84 m.p.h.; service ceiling, 11,160ft; operating range, 190 miles.

Powerplant data: total weight, 265 lb; equivalent power, 530 g.h.p. (take-off), 500 g.h.p. (max. contin.); compressed air flow, 7.5 lb/sec (take-off), 7.36 lb/sec. (max. contin.); compression ratio, 3 (take-off), 2.8 (max. contin.).



The Fiat 7002 helicopter is illustrated in model form in the heading picture; and in the g.a. drawing (right). Left, the Fiat 4700 compressed-air turbo-generator, the prime-mover section of which is similar to the 4002 turbojet.



THE ARMY AIR CORPS

A Visit to its Centre at Middle Wallop

An official sketch of the badge designed for the Army Air Corps and recently approved.

"THE Army Air Corps?" queried the rather serious young Royal Air Force policeman at the main gate of R.A.F. Middle Wallop. His voice had that slight touch of disdain which characterizes one Service's reference to another, and implied some suspicion about the Army having anything to do with the air at all—especially on and around a Fighter Command station. Then his police mind reverted to routine and he made formal entries in the arrivals log and proffered some brisk directions: "Turn to the right when you get to the top of this road and you will see three hangars ahead numbered three, four and five. It's No. 3."

Outside No. 3 hangar stood a businesslike line of camouflaged Auster 6s, 7s and 9s and also a Skeeter 10; inside it were silver Chipmunks with "Army" painted on their sides; along the front of the hangar were lecture rooms where small classes were in progress, and offices marked Chief Flying Instructor, Chief Instructor, Commandant. Through several windows could be seen a sprinkling of R.A.F. blue amongst khaki uniforms which bore variously R.A.F. and Army pilots' brevets.

This picture symbolizes the Army Air Corps Centre at Middle Wallop, the home of the A.A.C., which officially came into being on September 1 last year when the Army assumed full financial responsibility for all existing A.O.P. and light liaison units and when the Glider Pilot Regiment was absorbed into the new organization—which will be almost completely independent of the R.A.F. when on April 1 this year the Army takes over responsibility for the first- and second-line servicing of its aircraft. Thus a quiet Service revolution has taken place without daggers or assassinations being employed by either generals or air marshals; and on a part of Salisbury Plain equally venerated by the Army and the R.A.F. for its past associations, the sight of khaki-clad officers flying aircraft strikes a chord which jangles back forty-five years to hallowed names like Larkhill and Bulford, Netheravon and Old Sarum.

Brig. G. P. L. Weston, D.S.O., O.B.E., Commandant of the Army Air Corps Centre, with (right) the Chief Instructor, Lt-Col. C.D.S. Kennedy, R.A.

But the A.A.C. is too busy getting into gear at Middle Wallop to have time for reflection on pious memories; it is careful to point out that it is not setting up as a rival to the R.A.F. (since its aircraft are limited to 4,000 lb a.u.w.); and the impression made on a visitor to its Centre is of exuberant keenness in concentrating on present organizational tasks, setting its own standards and anticipating future commitments. There is a pioneering wind whistling round the offices in No. 3 hangar.

At the head of the A.A.C. organization there is the Commandant, Brig. G. P. L. Weston, D.S.O., O.B.E., who wears an R.A.F. pilot's brevet as well as a paratrooper's badge and whose flying experience with both R.A.F. and Army symbolizes the foundation on which the new Air Corps is being built up. His bluff enthusiasm augurs well for its independent outlook in its future activities.

Army Air Corps operations are—and will be—world-wide, with its units at present based in Germany, Northern Ireland, North Africa, the Middle East and Hong Kong; but all its training and central administration will be carried out at Middle Wallop.

Under the Commandant and in charge of training there is the Chief Instructor, Lt-Col. C. D. S. Kennedy, R.A. Under Col. Kennedy's jurisdiction is the Pilot Training Wing, which has an R.A.F. chief flying instructor (S/L. M. Jones) and is divided into four flights—elementary, intermediate, exercise and helicopter. There are two other Wings at the Centre—Tactics and Technical (the latter being staffed at present by both R.E.M.E. and R.A.F. personnel)—and R.E.M.E. workshops. The work of these flying and maintenance wings can be understood by a description of the purposes of the A.A.C. and the stringent conditions laid down by the Army Council for membership of it.

The Corps comes under the sponsorship of the Director of Land/Air Warfare and operationally will have two main tasks, carried out by Reconnaissance and Liaison Flights. The former's work includes photography; special-to-arm duties for the armoured corps, engineers, signals and infantry; air observation (with particular reference to artillery fire); and additional work like traffic control, line-laying, maintaining a security courier service and carrying first-class mail. The Liaison Flights will have (as their title implies) communication and liaison duties. Like the Reconnaissance Flights they are to do line-laying and courier work, and in addition collect casualties and carry tactical stores.

Officers and N.C.O.s who come to Middle Wallop for pilot training are volunteers from all branches of the Army (officers, N.C.O.s and O.R.s from all Arms, except the women's branches, are eligible), must have a minimum of three years to serve at the conclusion of their training, must possess high educational standards and have passed through the R.A.F. aircrew selection board at Hornchurch. Thus the Centre receives for training a type of student who is not only keen to fly but has the physical and mental equipment to do so; and it subjects him to an arduous and intensive 33 weeks' (or longer) course, at the end of which he is expected not only to go straight into an A.A.C. squadron but to be of use to it and able to survive. All the time emphasis is placed on the prospective pilot's ability as part of

Aircraft with which the A.A.C. is being equipped for operational purposes: a Saunders-Roe Skeeter 10 (due to be replaced in the future by the more powerful Mk 12 version) and an Auster 9. Skeeter 10s, Auster 6s, 7s and 9s and Chipmunks are in use at the Centre at Middle Wallop, which houses No. 6 Independent Liaison Flight in addition to its training aircraft.

"Flight" photographs

Practising at Middle Wallop one of the tasks an A.A.C. helicopter pilot is expected to perform—landing a Skeeter in a restricted area, concealed from the enemy's observation.

THE ARMY AIR CORPS . . .

the Army. As the Chief Instructor puts it: "We work on the assumption that the chap we want to put into the air is a good Regimental soldier." In other words, the Corps is specifically an air arm for the Army, using aircraft to give it greater efficiency and mobility and more accurate knowledge of the enemy in a battle area. Training at Middle Wallop is thus essentially pragmatic in character; it combines the functions of F.T.S. and O.C.U. in the R.A.F.; the students learn not only how to fly and service their aircraft but also practise all the varied duties they may later be required to perform in the field.

In his first two weeks at Middle Wallop the prospective A.A.C. pilot is given a revision course and tested in basic Army knowledge and is also introduced to flying subjects—navigation, meteorology, theory of flight, airmanship, the morse code, and aircraft recognition and servicing. He then joins the Elementary Flight (at present under the command of F/L. T. D. Taylor, D.F.C., who is shortly handing over to Maj. D. C. K. Waddington, R.A.—eventually the C.F.I. will be the only permanent R.A.F. flying instructor) and there, side by side with aviation ground subjects, starts flying. Each pupil does approximately 60 hr on a Chipmunk, including elementary aerobatics, which help to give him confidence in handling his aircraft although he may never employ them operationally.

At the end of their 12 weeks' course in the Elementary Flight the pupil A.A.C. pilots (at present drawn mainly from the R.A., though the intention is they shall come from all Arms) spend a week on revision and take an R.A.F. Central Examining Board examination. If they succeed they pass on to the Intermediate Flight. Roughly half the failures on courses at Middle Wallop occur in the elementary flying stage; the failure rate over the whole course averages about 25 per cent.

In the Intermediate Flight students get to grips with the type of aircraft they are to fly operationally, converting to Auster 6s and proceeding to basic and advanced exercises on 7s and 9s. (Some, of course, eventually go on to Skeeters in the Helicopter Flight after 130 hr on fixed-wing aircraft.) In this section of the course Army subjects—gunnery, signals, photography, tactics and organization—take equal precedence with aerial ones and flying training. To quote the Chief Instructor again: "We want chaps who are good on the ground, not necessarily the cream in the air." Pupils spend 12 weeks in the Intermediate Flight, and during that time do approximately 70 hr on Austers. At the end of this three-month period they take their final written examination. Then, during their last six weeks at Middle Wallop (Auster pilots have 33 weeks' training altogether, Skeeter pilots six more because of the longer conversion course needed) pupil A.A.C. pilots apply all they have learned on the ground and in the air to its tactical uses—both helicopter and fixed-wing pilots doing the same type of training in their final stage, the Exercise Flight. The helicopter flight has as yet only two Skeeters; there should eventually be six or more.

There are progressively defined periods of training in the Exercise Flight, when the flying which has been learnt is applied tactically. In the first week the Auster pilots convert finally from Mk 7s to 9s, which have certain controls in different positions, and fuller instrumentation and more power, with an approach speed about 10 kt faster. In the second week pilots start to use the Army Type 62 H/F radio; practise "strip landings," i.e., setting their aircraft down in limited spaces marked on Middle Wallop's grass surface; learn to select landing-grounds in suitable fields (the local farmers having proved excellent at "Army co-operation"); and have their first day on the A.A. range, making their initial "shoot" with an instructor. In the third week they practise giving support to ground troops and also finding "continuous cover" for their aircraft—choosing new well-hidden landing sites near to advancing forces, and keeping their aircraft in the air all the time while concealing them as far as possible from enemy forces by precision low-flying. Tactical night flying comes into this stage of the course, and practice landings are made by the headlights of two jeeps parked 40yd apart. There are no landing-lights on the Austers, though provision is made for them within the forward wing-tips.

Similar tactical exercises occupy the fourth week, and include "flash spotting," when artillery fire is simulated by Aldis lamp or Very pistol. Then there are three-day "round-up" exercises, which involve everything that has been learnt on the course and some of it in quicker or reverse motion—a more rapid advance and a withdrawal. Pilots also practise ground jobs, such as laying out landing-strips; they make photographic sorties using a type F.24 hand-held camera (one Auster has a pod in which a type F.102 can be fixed); and each course is divided into two sides and practises "spotting" the other. Every pilot is given an I.F. test and has to finish the course with a white card rating. Finally there is a competition for the Station Commander's trophy—a silver model of an Auster.

What emerges from this course is, clearly, a pilot who can "fly by the seat of his pants," can read himself over the countryside by a one-inch map at low level, can absorb information fed into his ears simultaneously by V.H.F. and H/F radios, can take evasive action, pin-point a target 5,000yd away with 300yd accuracy, can put his aircraft down almost anywhere; and—most important of all from the Army's joint of view—is ready to play a vital part in a battle as a flying soldier. Quite a proportion of the failures at Middle Wallop occur through "mental constipation"—pilots being

ILLUSTRATED WITH "FLIGHT" PHOTOGRAPHS

Low-flying by an Auster 9—one of the constant requirements for A.A.C. pilots, whose technique in this aspect of their work must combine skilful judgment with absolute geographical precision. Flying the aircraft on this occasion was Sgt/Maj. J. Hutchings, D.F.M., K.R.R.C.

unable to absorb and act upon so much information fed into their heads at one time. Those who emerge are obviously trained to a high point of efficiency and worth every penny of the £6,000 that has been spent on each of them.

A special word should be added here about the Tactics Wing, which is responsible for the ground training of pilots at the A.A.C. Centre. Commanded by Maj. H. W. Simms, D.F.C., R.A. (whose position broadly corresponds to that of the chief ground instructor at an F.T.S. or O.C.U. in the R.A.F.), it has on its staff instructors in ground school subjects such as navigation, meteorology, airmanship and aircraft recognition, and instructors in signals and gunnery. Maj. Simms, among his other duties as O.C., has the complicated task of working out lecture syllabi for three courses simultaneously—the new entrants, and the Intermediate and Exercise Flights—and of adjusting these at short notice when flying is "scrubbed" because of the weather.

Behind the Flying and Tactics Wings at the A.A.C. Centre is the R.E.M.E. Technical Wing, whose staff is training men to take over all first- and second-line servicing. At present (until the A.A.C. has enough of its own) the trade school instructors are seconded from the R.A.F. Recruits for the school (in the main volunteers) are Class I and II vehicle mechanics who have previously worked on tanks or M/T or in allied trades, and they receive a nine weeks' course under four main headings—airframes, engines, instruments and electrics—which culminates in a trade test. As the C.O. of the Technical Wing, Maj. J. R. Probert, put it: "We are taking one man and making him into a four-trades man." (Though he admits that this can only be done with comparatively simple types of aircraft such as those the A.A.C. operates.) R.E.M.E. is responsible for the servicing of Air Corps aircraft on a world-wide basis. Although April 1 is the official date for the Army's take-over of first-and second-line servicing from the R.A.F., at that time the A.A.C. will still have many R.A.F. maintenance personnel working for it.

There are to be three types of R.E.M.E. workshop in the Air Corps organization: flight, for first-line servicing; independent flight, to do both its first- and second-line servicing; and squadron, for second-line servicing. The R.E.M.E. training school at Middle Wallop has been in existence about four months; and it also takes

Maj. D. C. K. Waddington, R.A., with F/L. T. D. Taylor, D.F.C. (right), from whom he is shortly taking over as commander of the A.A.C.C. Elementary Flight.

in telecommunication mechanics on a 12-week course which covers aircraft radio, instruments and electrics—for men who will eventually do the second-line servicing on this equipment. In addition, introductory courses are given for a number of tradesmen whose actual training is done by the R.A.F.—such as welders, painters (responsible for airframe surfaces, and also for safety equipment) and carpenters. Supervisory grades—such as armament artificers (aircraft)—are already being trained by the R.A.F. and by de Havilland and Saunders-Roe, these firms giving tuition entirely free; and the first of the senior N.C.O.s in these grades will finish their R.A.F. courses in about six months.

A technical services section is also being organized, which will eventually take over what the R.A.F. at present does for the A.A.C. at Command level, such as modifications and the revision of servicing schedules. Finally, not the least important part of the Technical Wing's work at Middle Wallop is the instruction it gives on engines and airframes to u/t pilots.

Also at R.A.F. Middle Wallop is No. 6 Independent Liaison Flight, equipped with Auster 9s (and formerly, before the a.u.w. limitation of 4,000 lb was imposed, with Sycamore helicopters). Thus all aspects of A.A.C. organisation and at least one aspect of its operational work are represented on the station—where, like the Joint Helicopter Experimental Unit, the Corps uses R.A.F. facilities such as the A.T.C.

What does the future hold for it? One hopes, never the really big occasion of a full-scale war; though its high standard of training should fit the Army's new air arm for any eventuality. For its operational tasks there is to be one squadron per division and each squadron will have one flight per brigade, with six aircraft (three helicopters and three fixed-wing) and seven pilots in each flight, representing as far as possible different arms. There are also to be certain independent liaison flights (like the one at

A class of Army Air Corps student pilots receiving ground instruction in the Centre's Tactics Wing.

(Below) Army - R.A.F. co-operation at Middle Wallop: R.E.M.E. tradesmen being instructed on an Auster.

Middle Wallop), each with six aircraft similarly divided. Normally, squadrons are to be commanded by a major and liaison flights by a captain (though where independent, by a major). The Austers employed will be the Mk 6 in Germany, the Middle East and at home, and 9s in the Far East. But the A.A.C. is hoping for something to replace the Mk 6 in reconnaissance duties, and would like to have the E.P. 9 for liaison work because of its greater load-carrying capacity. Its intention to have a more powerful helicopter has already been mentioned. The Mk 12 Skeeters are expected about May, and there is considerable interest in the Alouette.

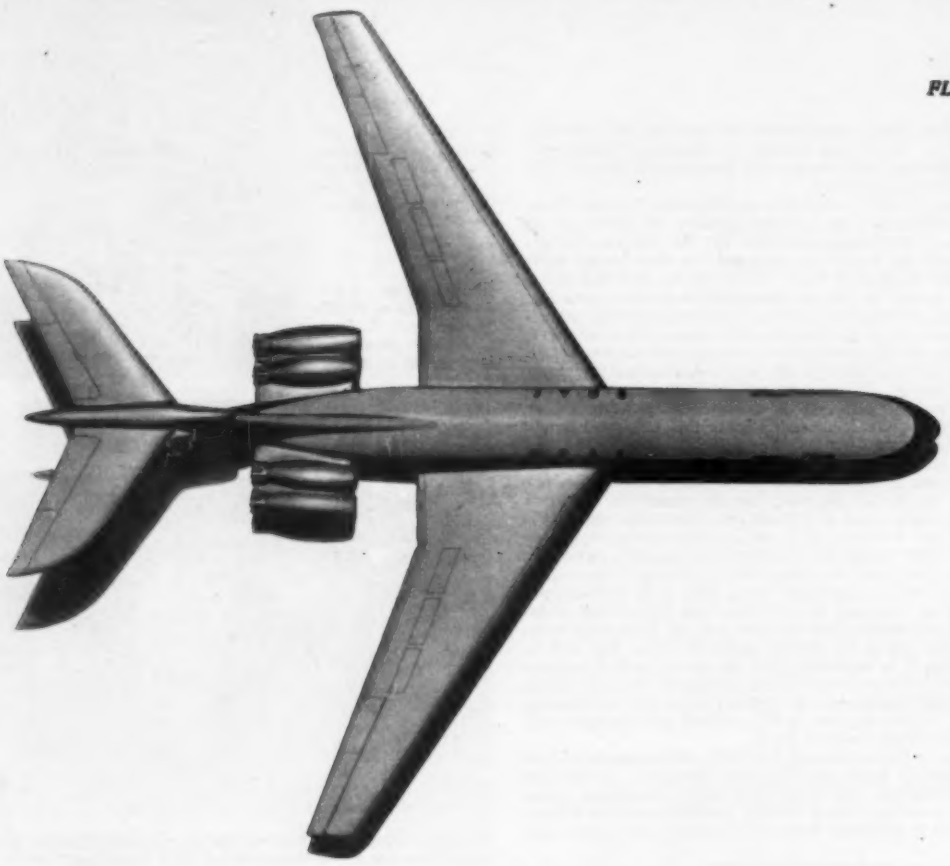
The A.A.C. is still in its embryonic stage, and at present only up to one-third of its planned strength. Its members wear their own regimental shoulder flashes, but a special type of A.A.C. beret is under consideration by the Army Council. This, like the paratroopers' red beret, would give a special feeling of individuality and pride in the Corps; but judging by the impression gained on a visit to its Centre no outward symbol is needed to make the keenness and morale of the Army's newest arm any higher than it is at present.

It is a considerable feat to turn an Army officer or N.C.O., in an age group much higher than that of the average R.A.F. u/t pilot, into a first-class flyer who has to work entirely on his own initiative according to instructions given to him over the radio. As S/L. Jones, the C.F.I., put it: "This is flying very near the limit—infinitely harder than much that the R.A.F. does." And in addition to achieving this standard at Middle Wallop, the A.A.C. is planning to send out its own Examining Board—consisting of the Chief Instructor, Chief Technical Officer, an A.A.C. and a C.F.S. examiner, and a Flight Safety Officer—to visit the Corps' units all over the world, ensuring that the highest standards are maintained.

Under the energetic command of Brig. Weston, the A.A.C. Centre is tackling its job with thoroughness and enthusiasm and proving that when it comes to flying the Army—though not bidding to rival the R.A.F.—can reach an equally high level of operational efficiency.

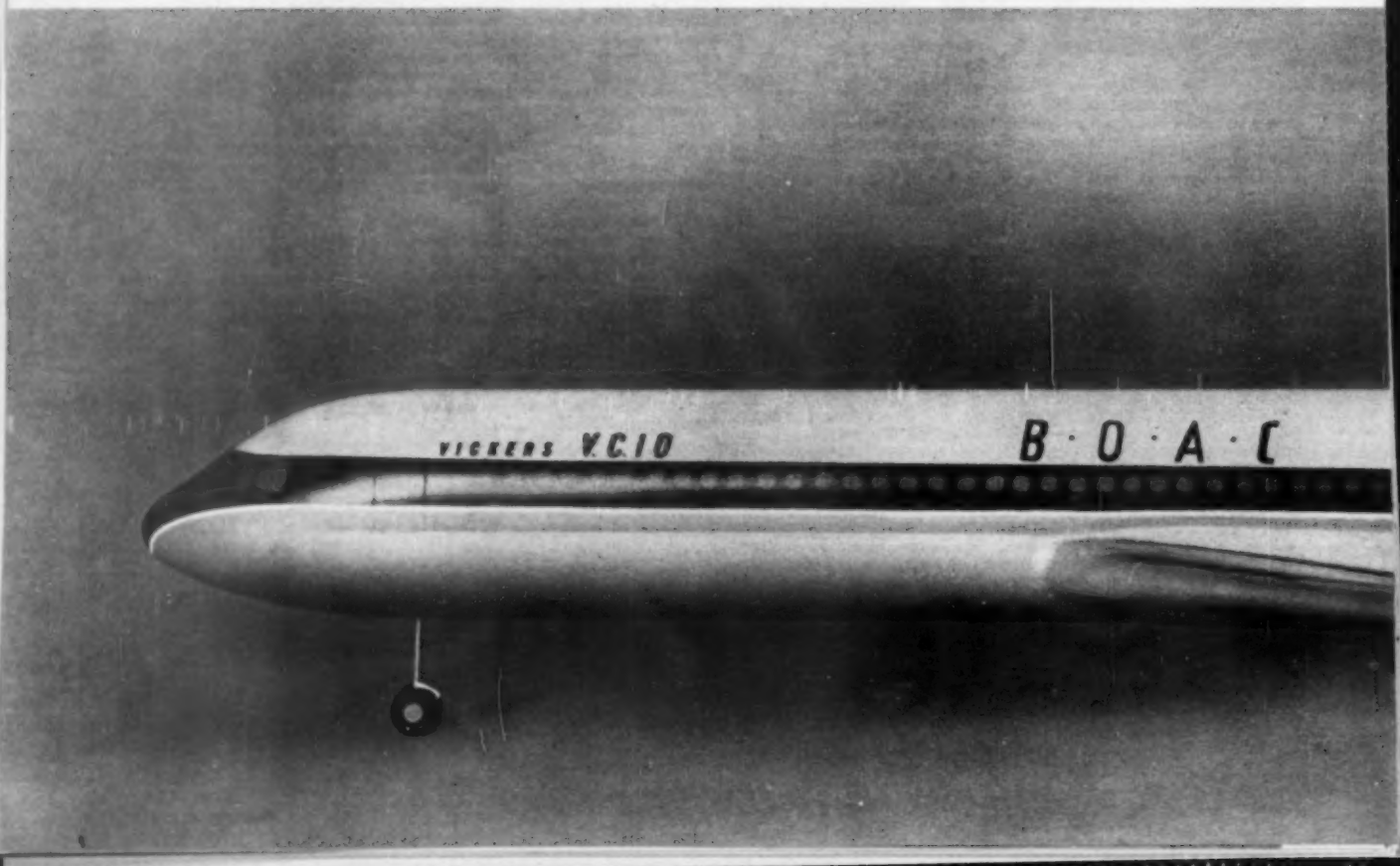
H. W.

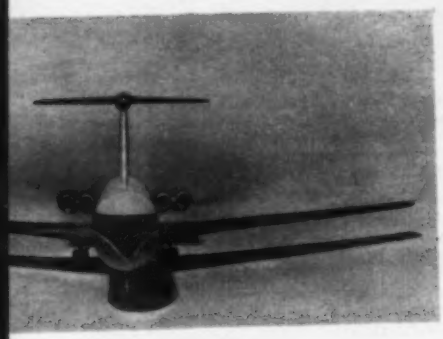
One of the Chipmunks used by the A.A.C. for elementary flying instruction about to take off on a training sortie at Middle Wallop.



VC.10

Exhibited in these specially posed "Flight" photographs
Eastern and African routes of B.O.A.C. during the 1960
structural strength and power to make it as good an Atla
designation VC.10, it will be powered with four Rol



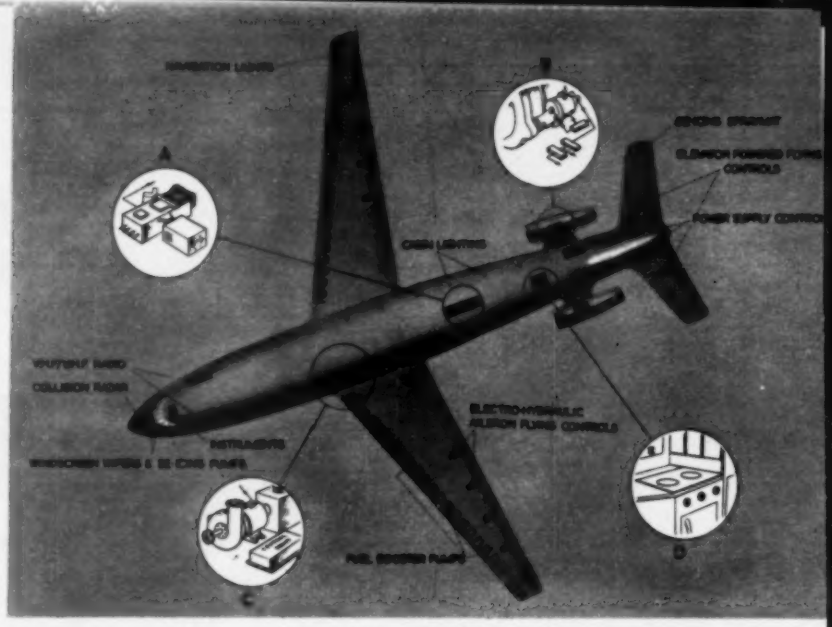


...odel is the shape of a Vickers aeroplane that will become familiar on the ... which, according to the Corporation's managing director, "has sufficient ...roplane as any." For the present unnamed, and known only by the maker's ...ce Conway by-pass turbojets, each delivering at least 16,500 lb thrust.

Aircraft Electrical Systems

A CRITICAL APPRAISAL AND SUMMARY OF OPINIONS PART I

By A CHARTERED ELECTRICAL ENGINEER



A diagram prepared by the English Electric Company showing disposition of major units in a paralleled A.C. system for a hypothetical transport aircraft. A, Doppler navigator (750W, 115V, 400 c/s ±5 per cent, 3-phase); B, main power supply (four 40kVA drives and alternators, arrows indicating loads and synchronizing); C, cabin-temperature control (10 h.p., 200V, 400 c/s, 3-phase); D, galley (current for hot-plate and for heated-food compartment).

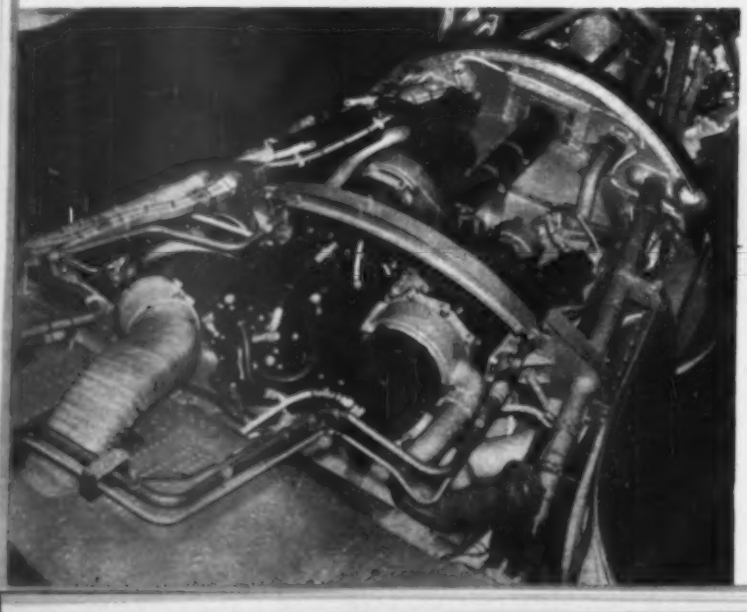
TO an electrical engineer who, though outside the aircraft industry, nevertheless takes an interest in aircraft electrical systems it seems rather odd that by this time designers of such equipment have not got round to deciding upon a more or less standard system for similar classes of aircraft.

At the present time there are main systems operating at nominal voltages of 28V D.C., 112V D.C., and 200V A.C. 400 c/s. In some cases the D.C. systems are supplied directly from generators, in other cases the supplies are derived from the rectified output of variable-speed alternators, which also provide a frequency-wild supply for such applications as de-icing, galley equipment and water heaters. With D.C. systems, just to make things more complicated, inverters have to be used to provide a controlled-frequency supply for certain instruments, radar, etc. So in some cases, the system begins with frequency-wild alternators, rectifies a large part of the A.C. output, then uses a D.C. motor to drive an alternator at constant speed in order to get a controlled frequency. On the face of it, the A.C. constant-frequency main system would appear to have all the advantages, but here again complications are supposed to arise because of the need to have a rectified D.C. supply for powering certain components, and a battery or an auxiliary power unit for emergency supplies, or the lot.

But the point is that since all these types of system are at present operational on aircraft of similar class they would all appear to be generally satisfactory, in which case could it be that the choice depends more or less on the whims and fancies of the particular aircraft electrical engineer?

Consider the systems of some of the British aircraft in service.

The Rotol accessory gearbox of a Viscount, showing the D.C. generator, alternator, tachometer-generator and cabin supercharger.



Viscounts have 28V D.C. generators supplying most services, frequency-wild alternators for de-icing, etc., and inverters. Vanguards will have frequency-wild alternators with rectifiers for the D.C. supply, so coming into line with Comets, Britannias and Victors. So it seems that the rectified A.C. system is becoming popular for British aircraft. There does not appear to be any *published* evidence that any British aircraft is using a constant-frequency A.C. system, but it looks as though English Electric are in production with the Sundstrand drive, for military applications.

Although apparently no British civil aircraft has, or is going to have, constant-frequency A.C., the Americans seem to be forging ahead in this respect, for A.C. systems are going into the Boeing 707 and the Douglas DC-8, both aircraft being equipped with Sundstrand hydraulic drives. Other American aircraft do, of course, employ the usual variety of systems. It is also worthy of note that the Canadair Argus has a constant-frequency A.C. system with Sundstrand drive.

Judging, then, by the different main systems in use (not to mention the secondary supplies) it would appear that, regardless of all the pros and cons put forward by the experts trying to make a case for a particular system, there is really so little to choose between systems that the aircraft constructor, on the advice of his electrical engineer, just backs his fancy and hopes for the best. Aircraft electrical engineers do not as yet seem to have got together with the object of attempting to agree upon something like a standard for aircraft of a similar class. Behind the scenes, perhaps, they are doing something about sorting out one system from another, but on the last occasion when they aired their views in public (the Convention on Electrical Equipment for Aircraft, held at the Institution of Electrical Engineers in May 1956) considerable differences of opinion were revealed. In the course of his introductory talk to the Convention, Sir George (then Mr. G. R.) Edwards had something to say "about the type of system that we are aiming at in these days":—

"We have gone through all sorts of permutations and combinations. I see no reason for going away from 28 volts D.C. on an aeroplane of medium performance where it is the easiest, the lightest and the most straightforward method. I do not see any magic in running away from something in order to do something different. I see great danger in running away to new generator systems which will produce high-voltage D.C. or high-voltage A.C. if you have not also made sure that there is a full range of equipment which can be operated off whatever the generating system is giving you. It always makes me laugh to see a very fancy A.C. system being rectified to enable great numbers of 28-volt D.C. pieces of equipment to be used. I think that you have enough information in these days to decide which is the right system to use for any given job. I merely ask you not to change it for the sake of change, and, when you do change it, to make sure that the equipment is there to take care of it."

The erudite papers presented at the Convention ranged far and wide, covering all the permutations and combinations referred to by Sir George; but the subsequent discussions seemed to emphasize the fact that certain aircraft electrical engineers had chosen a particular system and had every intention of sticking to it, come what might. Authors of general papers attempted to present an impartial survey of electrical systems, but there was, perhaps, a tendency to emphasize the advantages of a constant-frequency

system subject to the availability of a practicable constant-speed drive.

In a paper surveying aircraft radio power supplies Dr. B. J. O'Kane urged that a constant-frequency supply best suited the requirements of the radio designer. He stressed the advantages of operating valve-heaters in parallel and eliminating rotary transformers. "This is no new idea," he said, "on the contrary, it is so old that there must be some good reason, not obvious to the radio engineer, against the adoption of A.C. supplies. No doubt the absence of a constant-speed drive . . . has something to do with the lack of enthusiasm shown by aircraft designers, but there would now appear to be several types. . . ." He went on to refer to the "differences of opinion on the relative weights of D.C. and A.C. systems, but even on the assumption that an A.C. system is slightly heavier, the reduction of brush and commutator maintenance, particularly in high-flying jet aircraft, would seem to favour alternating current."

In replying to the discussion on his paper Dr. O'Kane pointed out that Mr. R. H. Woodall had stated in a paper given to the R.Ae.S. that a constant-frequency system was lighter than a D.C. system, whereas Mr. W. J. Scott in another R.Ae.S. paper had stated that design estimates had shown a slight disadvantage in weight and size of the A.C. radio power-supply equipment as compared with that of the corresponding D.C.-operated equipment. He added: "Although this apparently does not refer to the

English Electric Type 2502 starter/generator. Rating is 400A at 30V between 5,000 and 10,500 r.p.m. Altitude limit 50,000ft.

complete electrical system, I have heard it argued that there is a saving with D.C. systems."

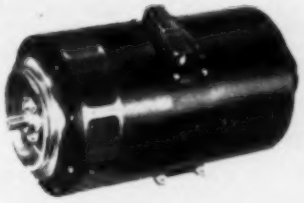
And argued it was in the discussion following papers dealing with (1) a 112 volt D.C. system; (2) rectified A.C. systems; and (3) a constant-frequency A.C. system. These papers had been presented, respectively, by Messrs. A. Ball and R. N. Lake; Mr. P. L. Cronbach; and Mr. P. C. Finucane. In the same session Dr. D. C. Flack in a paper about "future trends" did not seem to think that any sort of system could be standardized. Summing up he said: "The primary generation in any case will be alternating current; the D.C. supply, which will always be a requirement, will be provided by static rectifiers, and on large aircraft will possibly be at 56 volts. Rotary conversion equipment will not be used." He concluded by saying: "There is often a natural choice of supply for certain items of utilization equipment, and for this reason D.C. supplies and constant-frequency A.C. supplies will be necessary. It is essential, however, that where alternatives are possible the equipment designers should co-operate with the aircraft design team to arrive at the best overall results." Which statement suggested that every installation would be virtually tailor-made, incorporating special bits and pieces which in the opinion of the designers were necessary to ensure "the best overall results."

Opening the discussion, Mr. V. A. Higgs said that: "At every meeting where the question of alternating versus direct current arises there is always an extremely lively discussion. . . ." He noted that: "One paper gives ten reasons for using alternating current; there is only really one reason, a quite positive reason, which is that A.C. equipment is electrically more simple." He went on to discuss certain snags, although he thought that the "new high-performance aircraft will have to use A.C. power because it will not be possible to design D.C. equipment to survive in these aircraft."

Mr. J. F. Lewis referred to Messrs. Ball and Lake having "cast doubt on the standards for alternating current in aircraft. The standard for military aircraft is that main supplies shall be 400 c/s 200 volts 3-phase, and that has been so for some years." Later he declared: "We must find some way of letting the radio people know that there is a standard, and has been one for some time. The fact that we are still making 115-volt inverters does not mean that we want to go on doing so for ever."

Mr. L. G. Hill, in a communication included in the published version of the discussion, said: "There appears to be a body of engineers to whom 3-phase alternating current seems the panacea. Nothing could be farther from the truth." After emphasizing that the "main objection to direct current appears to be brush wear," and arguing that the real solution to the problem was better design and manufacture of commutators and slip-rings, with light brushes of adequate area, he maintained that the "adoption of 3-phase alternating current would introduce more problems than it would solve in the limited space available in aircraft. Descriptions of experimental systems carefully avoid reference to these additional problems."

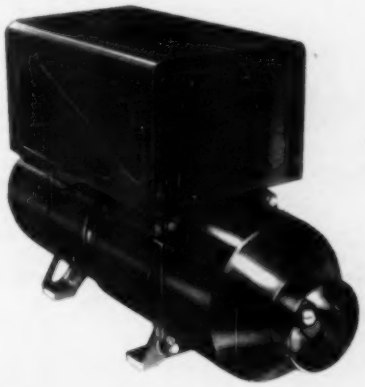
Arguing that the choice of a system was dictated by circumstances, Mr. R. J. C. Tarr pointed out that: "Rectification has



Rotax 80kVA variable-r.p.m., constant-frequency alternator (see "Flight," August 30, 1957, page 347).

been the only way to use our alternators for many years because we could not drive them at constant speed. A civil or transport aircraft with a lot of non-frequency-sensitive loads . . . representing a large proportion of the output direct from the variable-speed alternator, can use such a system economically. Most military aircraft, on the other hand, have a high proportion of frequency-sensitive loads, and the necessity to transform and rectify most of the alternator output increases the weight and cooling drag of such a system as to make it uneconomical. Circumstances change, however, and new rectifiers of higher efficiency, less weight and requiring less cooling could affect one's choice of system." He noted that the use of silicon rectifiers could result in weight saving on equipment.

Replying to the discussion, Mr. P. C. Finucane declared: "there appears to exist in this country a selection of diehards who try to discourage every attempt to introduce A.C. systems into aircraft. Judging by the discussion, these are in the minority and most of the objections can be put down to ignorance of the facts. I would like to make it quite clear that the aircraft electrical engineer will put in the best system, whether it be A.C. or D.C., to suit the rôle of the aircraft. If the demand at constant-frequency warrants it, then let us have A.C. systems and let us get down to the business of solving the minor problems which confront us in the same way that the problems of the 112-volt D.C. system have been solved —but a little quicker and a little better." In reply to a criticism



Plessey rotary inverter, rated at 3kVA and weighing less than 60 lb.

that A.C. motors were not suitable for applications requiring a high starting torque, Mr. Finucane pointed out that in a particular installation there were 53 A.C. motors which did not require high starting torques and eliminated "212 potential trouble-makers (brushes). . . ." He added that by a redesign of some existing equipments it was possible to reduce the continuous 28-volt D.C. demand to about 2 per cent of the total in large aircraft.

At another session of the Convention, Messrs. R. H. Woodall, P. J. Daglish and V. A. Higgs presented a paper on trends in the development of airborne electrical equipment, with particular reference to constant-frequency A.C. systems. From the discussion that followed a few deficiencies of the A.C. system emerged—in particular, the requirement for an A.C. motor developing a high starting torque.

Mr. H. Zeffert took exception to Mr. Daglish's "statements on

AIRCRAFT ELECTRICAL SYSTEMS . . .

policies agreed between himself and his colleagues." He argued that aircraft manufacturers had much to do with defining policies, adding: "We are quite open-minded on the relative merits of D.C. and A.C. systems and are constantly studying them. Both systems have to be used, but neither component nor aircraft manufacturers individually are in a position to dictate to the whole industry." He criticized the components manufacturers for the shortage of certain 28-volt components and suggested that the "industry should concentrate on making what we want and making it well; not try to force unproven and possibly unwanted systems upon us."

The authors had said in their paper that in their opinion "the electrical power requirements of future military aircraft can be met only by the use of a constant-frequency A.C. system at a preferred frequency of 400 c/s." They had also suggested that: "Designers of civil transport aircraft will, no doubt, make full use of A.C. equipment thus developed, thereby obtaining increased reliability for the operators and reducing equipment weight to a minimum."

Another contributor to the discussion on the paper, Mr. J. R. Ewans, announced that his firm was "very much in favour of the constant-frequency A.C. system, and we expect to be demonstrating this in flight very soon. Typical difficulties with D.C. equipment are that the aircraft is full of little ducts which are feeding very thin air in and out of electrical machinery, that a "22½kW generator cannot in fact be used at this rating and must be regarded as a 12kW generator, and that on occasion the brushes on D.C. motors have to be changed after a couple of flights."

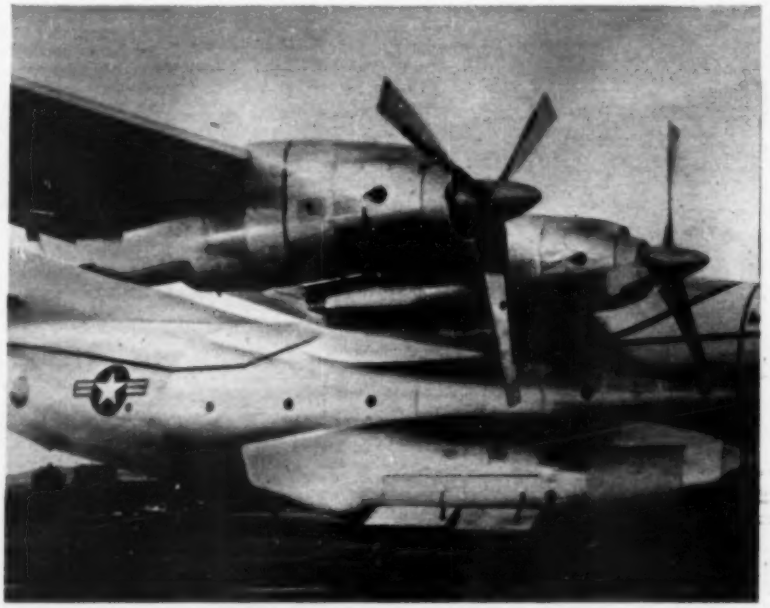
Replying to the discussion, the authors maintained their attitude that the constant-frequency A.C. system was essential to meet future requirements. In commenting on Mr. Zeffert's contribution to the discussion the authors said: "Obviously the aircraft electrical equipment manufacturers are happy to give the industry the type of equipment they specify, but they must advise the industry on its future requirements. For medium-range subsonic civil transport aircraft, there may still be a case for the retention of a 28-volt D.C. system, but Mr. Zeffert will know that, with regard to one aspect only, that of starting, there is a decided disadvantage in using 28 volts, particularly with a self-contained starting system."

These extracts from the report of the Convention (published in the *Proceedings of the Institution of Electrical Engineers*) suggest that the present position in regard to aircraft electrical systems is more than a little confusing. Certain trends, however, are apparent and will be discussed in the second part of this article.

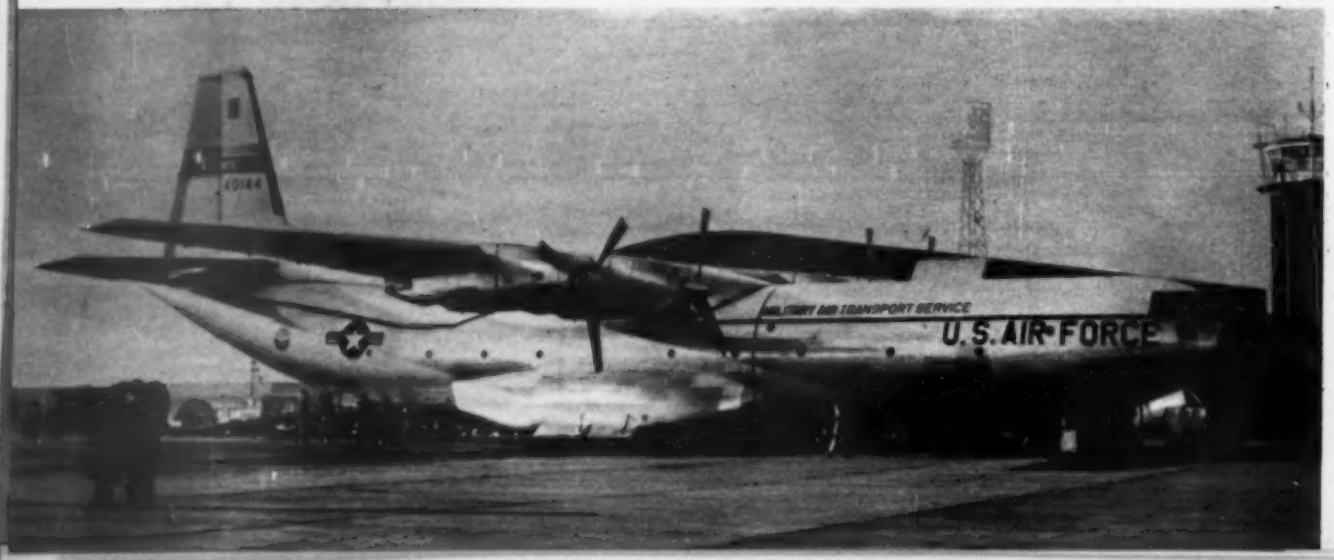
(To be concluded)

Burtonwood's Big Visitor

C-133A Drops in with 40,000 lb



The world's largest military air transport aircraft, the Douglas C-133A (four P. and W. T34-P-3 turboprops of 6,000 e.h.p. each), made its first visit to this country on January 12 when one landed at the U.S.A.F. base at Burtonwood after a ten-hour trip from Dover A.F.B., Delaware. The aircraft returned to Dover two days later. About 40,000 lb of freight was carried in each direction. The C-133A (A.F. serial 54-0144) is one of two that are making trips to Europe to test loading and off-loading facilities. The visit to Burtonwood was the second of these visits, the first having been to Chateauroux, France. The C-133A at Burtonwood belonged to the 39th Air Transport Squadron, M.A.T.S., and was commanded by Captain R. R. Bern.



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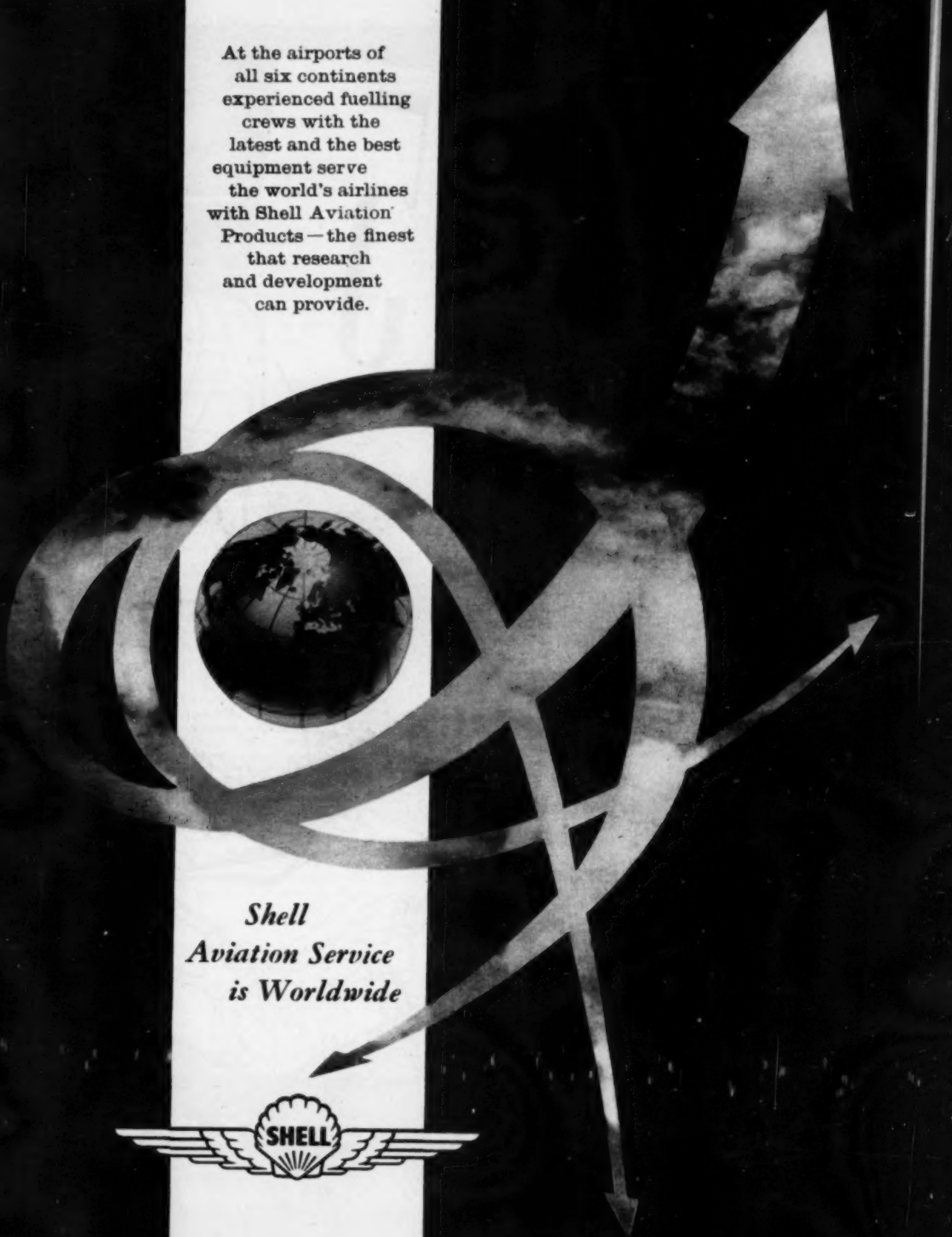

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CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Restrictions on the Private Pilot

IT would seem that after several weeks, and sundry red herrings, such as one-eyed pilots, etc., that "Airline Pilot" (January 10) is still defending M.T.C.A. air traffic control staff "who do not invoke the law lightly."

I believe this correspondence started after the prosecution—at Eastleigh—of a Mr. Harris, who entered Southampton Zone after diversion and force-landed at Eastleigh due to weather conditions.

How would "Airline Pilot" feel, after losing all gyro instruments and radio in I.M.C. with a load of passengers? His first thought—and duty to his passengers—would be to land at the first available airfield, "to keep himself alive"—as Mr. Harris did. No doubt he would look pleasant when fined £25 plus £10 costs later on.

Surely the purpose of A.T.C. is to promote the safety of all who fly. Every year the Survey of Accidents counts the skulls of those killed "continuing flight in unsuitable weather or beyond pilot's experience."

Things have come to a pretty pass if the Reaper can count among his allies A.T.C., an inflexible traffic control system, and M.T.C.A. Legal Branch!

Arundel, Sussex. FOX ECHO.

Clubs and Commercial Pilot Training

REFERRING to the correspondence about restrictions on the private pilot I would like to enlarge on "Airline Pilot's" remarks (November 29 and January 10). He hits the nail right on the head when he criticizes the average private pilot's ignorance of, and contempt for, the non-flying aspects of piloting.

No one minds if the aforesaid P.P.'s ignorance of Control Zones, etc., leads him to fly strictly within the limits of his knowledge. This is what the average P.P. does anyway. The danger arises when flying clubs which have up till now catered exclusively for the private pilot try to cash in on the growing demand for commercial pilots and offer "cheap" facilities for obtaining licences without a very clear idea themselves of what commercial flying involves. Thus we have the rather frightening aspect of flying instructors who themselves have only a Private Pilot's Licence and no R.A.F. training as instructors—in other words, a "cheap" instructor's course attempting to train the future generation of airline pilots.

Many years of training R.A.F. pilots, private pilots, commercial pilots and instrument-rating candidates has clearly demonstrated to me the tremendous difference in approach necessary in all these aspect of instruction. There are clubs, of course, whose training is founded on sound lines and with all due regard to the laws of the land I myself have been associated with such a one and this type of club will not come unstuck as it becomes more ambitious.

The fact that the products of clubs of the type I am criticizing might be able to pass the M.T.C.A. tests at the umpteenth attempt is beside the point. We all know that the ability to pass the driving test does not make a safe driver.

Incidentally, how does it happen that the clubs who enjoy a petrol-tax rebate because they cater for the purely private club member are now able to advertise themselves as "schools" and cater for the members of the public who wish to obtain a Commercial Pilot's Licence?

Warsash, Hants. PERTURBED.

The First Trans-Antarctic Flight

IT is not often that *Flight* slips up in aeronautical history, but a slip in your issue of January 10 was no doubt due to the misleading information given out by the B.B.C., who repeatedly stated that S/L. Lewis's magnificent flight with three other aircrew in a de Havilland Otter from South Ice to Scott Base was "the first flight of a single-engined aircraft across Antarctica."

I yield to none in my admiration of this 1,300-mile flight across the Pole, which shows how the Royal Air Force can navigate across vast uncharted areas when all the usual radio aids are missing. I believe the range of the American beacon at the Pole is only 30 miles, so it would be of strictly local significance.

But remembering what we feel when the Americans talk of Lindbergh making the first flight across the North Atlantic one can imagine their reaction when we push out publicity which ignores the considerable achievement of their great explorer Lincoln Ellsworth. He flew in a single-engined Northrop Gamma of 600 h.p., with the Canadian Hollick-Kenyon as his pilot, from Dundee Island across the Antarctic basin to Little America in 14 hours' flying time in 1935. They made no fewer than four intermediate landings for survey purposes, and ran out of petrol 16 miles short of Little America, so that they had to walk the last part of the journey.

It would almost certainly be true to describe S/L. Lewis's flight as the first single-engined one *across the South Pole*, but in talking about trans-Antarctic single-engined flights, Lincoln Ellsworth's must receive pride of place as the first ever.

London, W.1. JOHN GRIERSON.

Aeronautical Historical Society

NATURALLY I am delighted to see that my letter (December 6) has provoked response and I can assure Mr. Andrews (January 10) that I am fully aware of what I am starting in my suggestion for an aeronautical historical society. My very reason for its formation is that posterity will have, once and for all time, checked and cross-checked authenticity. We would not, for instance, have any argument as to when Cody first flew, and I suspect that an argument *will* break out on that subject this very year. Otherwise, why does Gibbs-Smith say "5th October, 1908" (*A History of Flying*, page 246) and Broomfield (and the tree at Farnborough) "16th May"? I am fully aware of the existence of the Brookses, the Bruces, the Jacksons, the Gibbs-Smiths, the Senrabs, the Cowleys and the rest of the movement; and it is they—together with the rest of them—that I would see foregather to listen to papers of the calibre of Pritchard's papers to the Royal Aeronautical Society.

A further object would be to try to ensure that any historical material that is still left in private archives will not be destroyed. The writer has experience of invaluable documents and photographs having been destroyed simply because executors and widows have no idea of their value. An aeronautical group would have far greater chance of hearing of odd collections than does the individual with only one pair of ears to the ground and one pair of eyes to keep skinned. As long as people go on saying "What is there to discuss?" or "What's the use?" we shall get nowhere, but even if these people with a common interest met once or twice a year just to drink coffee, *something* would arise from it.

London, W.1. BELTANE.

East is East . . .

A QUICK comment on the article on page 668 of your November 1 issue. The photograph at the top of the page shows what appear to be large and elaborate buildings at Beirut's airport. Your caption says that these five buildings must be expanded to cope with the expansion of traffic there. You then cite 1,000 aircraft movements a month (12,000 a year) as the reason for this needed expansion.

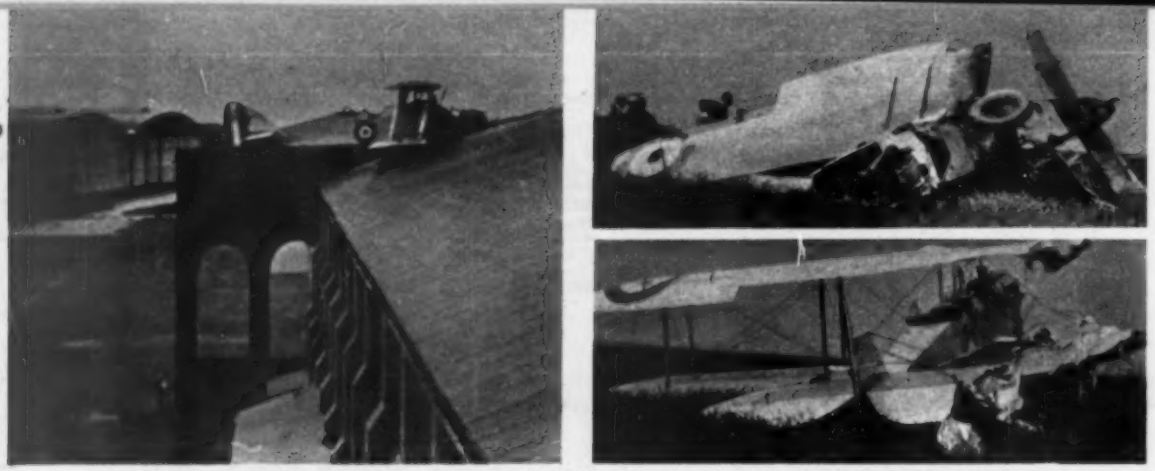
The folks over there must have some extra money lying around that they want to justify spending. Over here, our C.A.A. won't even consider installing a control tower at an airport until it averages 24,000 movements a year. The little towns of Pocatello, Idaho, and Wheeling, West Virginia, each average well over Beirut's present traffic volume—and their buildings would hardly compare with Beirut's present palatial facilities.

Washington, D.C. MAX KARANT,
Vice-President, Aircraft Owners and Pilots Association.

Technicians' Status in North America

ONE of the most human failings is to look back to the "good old days." It seems that the human mind has a powerful filter which rejects unpleasant memories of any "past" which can be separately packaged as "in the Old Country" or "before the war." Even so, most of the expatriates who write home to Britain about life in North America (the engineer sink of most interest to me personally) seem to be in the small minority of malcontents and social misfits, so that as far as I can judge from English publications, a most unfair picture of an immigrant's lot is given. The 98 per cent who wouldn't go back for any consideration are almost never heard from, possibly because they have no incentive to stand up and be counted; they are too busy enjoying themselves in the present!

My friend Ted Weiss has provided me with such an incentive, however, in his letter (*Flight*, November 15, page 787) describing the harrowing lot of the North American engineer. It would be boring to particularize over such trivial points, but at my present company all his comments are completely refuted, except that we have no official tea breaks—and who, saving old women and Civil Servants, wants a tea break anyway? During the past two years I have travelled fairly extensively in the United States and again I must say that at none of the companies I visited was there the slightest confirmation of his remarks, or of his implied



D.H.9As in extremis at Sealand in 1926 and (right) 1925—the pictures referred to below by Mr. C. H. Wells.

CORRESPONDENCE . . .

comparison. Even allowing for the drop in status which senior engineers usually suffer by changing continents, their lot in North America is immeasurably superior to the conditions they suffered in England. In common with many thousands of colleagues I frequently kick myself for not having emigrated years ago.

It would obviously require several books to substantiate this comparison in any detail, and a wider experience than mine; and certainly a wider experience than that of Ted Weiss, who has spent all his time along the Eastern seaboard, much nearer to England than California! But summarizing such experience as I have, I would suggest that, purely as a matter of looking after number one, no competent engineer can fail to achieve a richer and more satisfactory life in North America; and I do not speak as a culturally blind materialist. As a Frenchman has observed, "A beautiful life is expensive; it can be cheaper, but then it is not so beautiful." Here one can own and do all the things one ever wanted and still save (in my case anyway) a sum equal to my entire salary in England. And career-wise there is literally no limit for a talented man; in the United States in particular he can form and finance his own company with about the same degree of effort as is required in England to buy a new car. He may also go bankrupt just as quickly, of course!

As a final point, the tendency to generalize about environment should be limited. Ted Weiss lives farther from California than England lies from Turkey, and who would try to sample Turkish life in a London pub? I live in Southern Ontario, which is rather like a Utopian version of England. I would also consider living in California, Maryland (well clear of Baltimore), or British Columbia. But Montreal, Quebec, is more foreign to me than Paris, France; I would rather die a clean death now than live in Chicago, or Columbus, Ohio. And to follow Ted Weiss to New England I would need an attractive salary hike, unless the job were near Boston, Mass!

But since the same considerations apply even to a small island like the United Kingdom I consider that the advice "go West young man" can be given unreservedly to all British engineers. This may not be very good for the U.K. aircraft industry, but my remarks are confined purely to what is best for the individual engineer. It is a good principle never to agitate for improvements; get out, and go where the improvements already exist. Go, that is, outside the sphere of the S.B.A.C. bosses' union. Supply and demand will look after the larger issues.

Downsview, Ontario. P. R. PAYNE.

Sealand Soliloquy

THE article, "Leaves from a Line Book," by "Jaysee," in your issue of December 20, gave me an acute attack of nostalgia. I was an "erk" at Sealand in those happy days and have first-hand knowledge of some of the incidents described.

"Climbing the hangar wall" as a passenger in a dual-controlled Sopwith Snipe piloted by Sgt. "Pedler" Palmer was part of the daily routine. Another short cut to death was the hand-swinging of the Snipe's engine, which was accomplished by two mechanics standing side by side and gracefully stepping clear on the downward swing of the propeller and the word "Contact" from number one. Lack of the necessary grace could have been catastrophic. We also loved to sit on the Scarff ring in "Nine ack" or "Biff"—no casual passenger ever used the gunner's anchor chain. In my experience this practice continued until somebody fell overboard into the Mediterranean—from 2,000 feet.

The enclosed photographs may interest readers. One illustrates your contributor's story of the "Nine Ack" which landed on the hangar roof. I was on duty crew on that occasion. The pilot was not the A.O.C. but a wing commander who was A.D.C. to the C.A.S., Lord (at that time Sir Hugh) Trenchard, who visited the station on the following day. He had glided in with his radiator shutters open. Consequently his engine was cold and failed to answer the throttle when he came to flattening out. "Boom" watched the salvage operations. Incidentally, the damage to the aircraft was more severe than your contributor suggests, and it was not the fall from the roof which caused the write-off. As the photograph shows, the fuselage was neatly resting on the brick buttresses until we got busy.

The other pictures illustrate a characteristic of earlier aircraft which is absent today. These two collided when one (the less severely damaged) was taxying and the other was taking off. Those of us who were watching expected the worst, but I am sure we were not surprised when four somewhat shaken but otherwise unharmed occupants stepped out. So far as I remember they were all airborne again within a matter of minutes, as was the custom in those days. The point I would make about that accident is that all the victims survived. Today——? Readers who may have witnessed the crash will remember that the pilots were F/L. "Paddy" Burke and F/O. Lloyd-Evans, both instructors. L.A.C. Byrne (carpenter rigger) and a pupil were the passengers.

The Service existed on a shoestring in those days, but I am certain that all who were privileged to serve then will stoutly declare today that they enjoyed every minute—well, *nearly* every minute.

Derby. C. H. WELLS.

FORTHCOMING EVENTS

Jan. 28. R.Ae.S.: Graduates and Students Section: "Developments in Glider Design," by K. G. Wilkinson.
Jan. 29. Kronfeld Club: "Cloud Study" films.
Feb. 1. British Interplanetary Society: "Meteoric Hazards to Space Flight," by Dr. N. H. Langton.
Feb. 4. Kronfeld Club: Talk on B.G.A. gliding courses.
Feb. 5. Kronfeld Club: "The Oxygen Story," by G. Melvill-Jones.
Feb. 7. Helicopter Association: "Wind Tunnel Testing of Helicopter Models," by M. S. Hooper.
Feb. 7. A.B.A.C.: Annual Dinner.
Feb. 10. Institute of Transport: Bruncker Memorial Lecture: "Problems and Economics of Air Traffic," by A. Cdre. W. E. G. Mann.
Feb. 12. Kronfeld Club: "Flying and Motor Racing," by R. Flockhart.
Feb. 13. R.Ae.S.: Main Lecture: "Application of the Theory of Stability in Structural Design," by H. L. Cox.
Feb. 18. R.Ae.S.: Section Lecture: "Aeroelastic Problems Associated with High Speeds and High Temperature," by E. G. Broadbent.
Feb. 19. Royal Meteorological Society: Discussion: "Meteorological Aspects of Rockets and Satellites."
Feb. 19. Kronfeld Club: "North Wales, The Soaring Pilot's Paradise," by W. Crease.
Feb. 20. R.Ae.S.: Main Lecture, at Halton: First Trenchard Memorial Lecture, by Air Chief Marshal Sir Dermot Boyle.
Feb. 26. R.Ae.S.: Presidential Address by Sir George Edwards.
Feb. 26. British Institution of Radio Engineers: "Dectra: A Long Range Navigation Aid," by C. Powell.
Feb. 27. Aerodrome Owners Association: Annual General Meeting.

R.Ae.S. Branch Lectures (to Feb. 27):—

Jan. 27, *Halton*, Film Show. Jan. 28, *Bristol*, "Aircraft Flight Systems," by Capt. A. M. A. Majendie. Jan. 29, *Preston*, "Ramjets," by Dr. R. R. Jamison; *Southampton*, "Flight Testing Procedures at Supersonic Speeds," by W/C. R. P. Beamont; *Weybridge*, Film Show. Jan. 31, *Chester*, Annual Dance. Feb. 3, *Derby*, A.G.M.; *Henlow*, A.G.M. Feb. 4, *Luton*, "Development of the Armstrong Siddeley Viper," by W. H. Lindsay. Feb. 5, *Brough*, "Supersonic Aircraft and Missiles," by P. J. Duncton; *London Airport*, "Noise," by Prof. E. J. Richards; *Reading*, "Ultra-Sonic Testing," by J. Crowther. Feb. 6, *Bristol*, "Design of Civil Aircraft," by D. P. Thorne; *Isle of Wight*, "Development of the Rotodyne and Gyrodyne," by D. M. Davies; *Swindon*, Lectures. Feb. 11, *Boscombe Down*, Film Show. Feb. 12, *Chester*, "Aircraft Fuelling Problems," by E. L. Bass. Feb. 13, *Bristol*, "Production of Civil Aircraft," by Mr. Imlach; *Cheltenham*, "The Microscope in Engineering," by A. E. Bingham. Feb. 19, *Leicester*, "Activities of the Production Engineering Assoc." by R. Tilsley; *Southampton*, Branch Prize Papers. Feb. 20, *Bristol*, "Sale of Civil Aircraft," by R. White-Smith; *Cambridge*, Lecture by H. Povey. Feb. 26, *Preston*, "Problems Associated with Non-Metallic Materials in Aircraft," by N. J. L. Megson and E. W. Russell. Feb. 27, *Bristol*, "Servicing of Civil Aircraft," by I. Gregory.

Straight and Level

WHY are the airlines so touchy about "third-class," preferring euphemisms like economy-class, thrift-class, coach-class, T.34-class, and so on? I suppose they feel that the term third-class evokes an image of cramped seating, discomfort, and take-it-or-leave-it service. It doesn't, of course; but supposing it did? Personally, all that matters to me is a low fare, for which I will tolerate considerable privation—within the bounds of safety and hygiene. The sooner the airlines forget to treat each passenger as a neo-Elizabethan milord the sooner they will tap the mass traffic they are always talking about, and the healthier their industry will be.

● Incidentally, if the airlines want to make a go of third-class business, why don't they throw away those heavy, high-backed, reclining chairs and substitute light, simple, close-pitch bus-type affairs? These would be quite adequate for trips of less than three or four hours. I would guess that if, say, a DC-6B operator did that he would save weight and space which would permit the accommodation of easily 100 passengers, compared with the present maximum of 85. Likewise, you might get more than 60 seats in a Viscount 700.

By all means cater for the wealthy and expense-account travellers—in a separate part of the aeroplane if you want to pep up first-class-traffic-generating frequencies; but whether or not I am typical of the would-be mass air traveller, I will ride with anyone who offers me "third-class" service.

● The influence of the aeroplane upon the design of American cars was never more apparent than when Detroit body-stylists introduced the fin. So strongly waxed the cult that when General Motors (at the same time making other changes) dispensed with it on last year's models their sales fell appreciably. No self-respecting American motor-car owner would be seen dead without his fins—and "do-it-yourself" fin-conversion kits were in spectacular demand.

The fashion spread to the motor-boat (and even, I believe, to perambulators). Now see the triple-feature programme below, ending with the "new exterior paint-styling of the 1958 Cessna 172."

Is this where we came in?

● Many people will no doubt feel that it is a terrible thing to suffer under a Board chairman or other "ultimate top-brass" who fondly imagines that he understands what you are doing and can offer helpful advice. I would, for example, feel extremely sorry for the A.E.R.E. at Harwell should we ever—by some unlikely chance—have a Supply Minister who spent all his spare time avidly reading popular explanations of nuclear power.

What I am leading up to is the fact that, whereas lots and lots of people think that they understand the aircraft industry, and could "put it right," very few claim to understand modern aeroplanes. For this we must feel profoundly grateful. Just imagine what would happen if our creations were a little less complicated. First, no design team could hope to produce anything without there being a public inquiry into some aspect of the structure which broke new ground. Just like a proposal for a very high building, so would the programme for a very fast aeroplane become a storm centre for every Tom, Dick and Harry, or ex-P.R.A. Think what would happen if the Royal Fine Arts Commission didn't like the plan-form of the wing . . .

● My old friend Air Marshal Sir Charles Blackout, managing director of Scruggs Aircraft Company, Ltd., tells me of a forthcoming new brochure for the S.221 Scruggsliner. "We decided on the format after a world-wide survey of airline brochure requirements," states Sir Charles. For example, it will have 178 pages, a number which will suit "the large majority" of operators. Several notable improvements on previous brochures will be offered, including real pigskin binding with acetate overlay, 48-colour lithographic illustrations, and 10pt Perpetua type-face on glossier art paper. "My experts estimate a need for 1,000 of these brochures between now and 1965," Sir Charles tells me. He adds: "It reads beautifully."

I hope I am not letting out any secrets when I tell you that the brochure measures 6ft 2in by 4ft. Power-operated page-turning is installed.

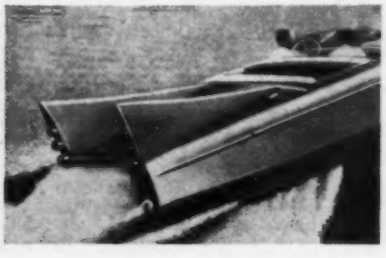
I asked Sir Charles what he thought of the Government's view that the development of such major brochures could not nowadays be undertaken by one firm alone—even one with Scruggs' unparalleled brochure experience. "Rubbish," he retorted. "What we need is more firms doing more brochures. Britain is still a great country, and our genius can beat the world. Scruggs has proved itself a world leader in the brochure business. I grant you we have had Ministry development contracts—but quite rightly so, in the national interest. As for all these people in our industry who up and boast about their records in the brochure field, they just make me sick. We aren't a bunch of kids."

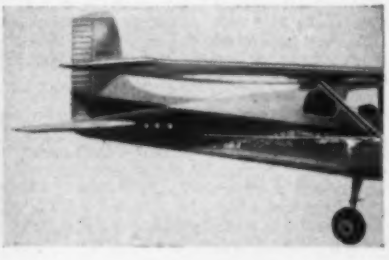
● It's a great temptation, in supersonic designs, to use the fuel as a heat sink, i.e., to make it do all manner of cooling jobs in various parts of the aircraft. The result seems to be either a universal acceptance of Armstrong Siddeley's vaporizing-combustion ideas or (in tropical countries, anyway) the installation of refrigeration plants to make sure that the fuel is jolly cold when it goes aboard. Even the fuel heat-sink may be a passing phase, because people are now trying to cook up fuels from "slurries" with suspended metal particles as a stepping stone to burning metals like magnesium or aluminium. Why not burn the whole airframe? As a method of reducing drag this would be without parallel.

● Few people on this side of the Atlantic, I suspect, have ever heard of Paul Hagan. He is a Beechcrafter, i.e., he is employed by the Beech Aircraft Corporation, of Wichita, Kansas—as a generator expert. In one recent year he drove 60,000 miles and flew 40,000 miles, mainly on visits to U.S.A.F. bases. The more I try to work out how he did it the more respect I feel for him. I wonder how close to this one can get in Britain; it sometimes takes me 30 minutes to go 1.4 miles from my office on the South Bank to Piccadilly Circus.

● At last—someone in the aircraft industry who really knows what he is doing. Clarence L. Johnson, Lockheed chief engineer, says that the design aim behind the F-104 is "to get the maximum kill probability per dollar investment."

ROGER BACON.





Club and Gliding News

OPPOSING views on the future of the British gliding movement were put forward with vigour and eloquence at a well-attended Kronfeld Club debate on Wednesday of last week. The motion, "That this house wants gliding in comfort and joy," was itself an indictment of the decadence towards which the movement was heading—in the opinion of the opposing speakers, David Carrow and Michael Gee of the Cambridge Gliding Club. Proposers Wally Kahn (Surrey G.C.) and Beryl Stephenson (London G.C.), however, insisted that amenities and civilized comfort were essential—though this did not imply luxury in the form of chromium-plated gin-palace-type clubhouses. Discussion from the floor was lively, and included contributions from Sir Roger Conant, M.P., Betsy Woodward (who disproved the assumption of absolute comfort at U.S. gliding sites); and Frank Kinder, architect responsible for the design of a projected national gliding centre, which, on view for the debate in the form of drawings and a model, aroused much interest. The final vote produced a large majority in favour of comfort and joy. Chairman for the debate was Ken Owen of *Flight*.

NEW Year changes at Elstree included the appointment of W. H. Bailey as chief flying instructor of Elstree Flying Club, following David Ogilvy's move from that position to be chief instructor of Air Schools, Ltd. Mr. Ogilvy is now administratively responsible for all flying and ground training within the Air Schools group, and his duties will include the resuscitation of the now-dormant Derby Aero Club.

Ground tuition in the Elstree Club's full-time course for the Commercial Pilot's Licence and Instrument Rating, which begins on January 28, is in the hands of Capt. E. Brook-Williams, who was for many years superintendent of navigation for B.O.A.C. Advanced and specialized Link Trainer instruction will be by Brian Garwood and Bert Hazzard. Claiming to be the only club or school in the London area offering a complete *ab initio* ground and flying course "under one roof," Elstree expect to complete the C.P.L. syllabus (for which the total fees are under £1,000) in 32 weeks, with an extra 6-9 weeks for the Instrument Rating. Most of the flying will be in Chipmunks, but twin-engine conversions will be included. Training in the use of radio equipment is carried out at Luton Airport, and arrangements have been made for Luton Homer to be manned in connection with night cross-countries. Students from France and Germany are among those who have enrolled for Elstree's C.P.L. courses.

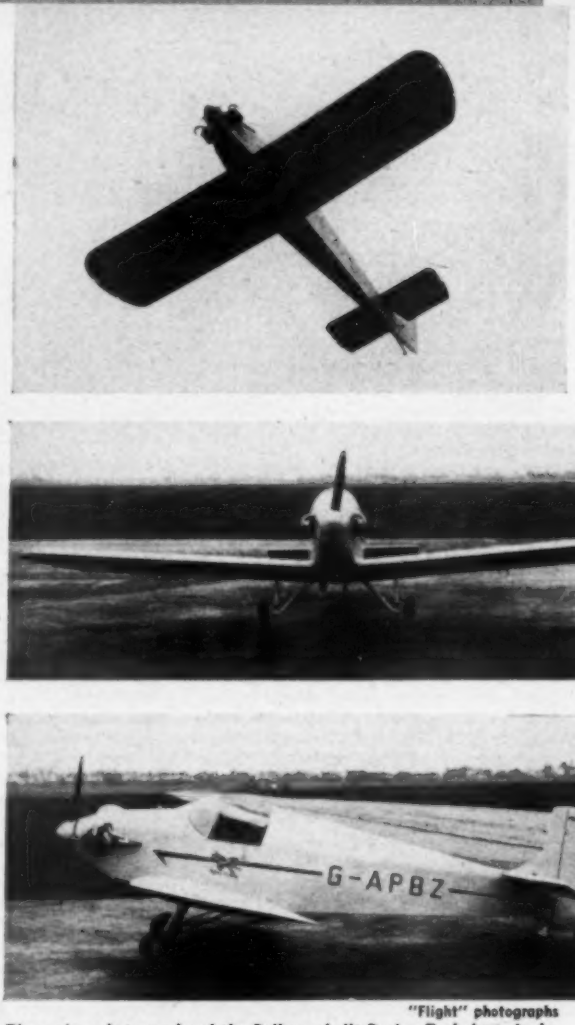
Last year's flying total at Elstree Flying Club was 3,822 hours, with an average of seven aircraft on the training strength, compared with 3,709 hr and nine machines in 1956.

A RECORD total of 6,671 flying hours during 1957 has been reported by Fair Oaks Aero Club. In an endeavour to reduce the noise nuisance to local residents, the circuit direction at Fair Oaks is to be changed every four hours and long exhaust pipes are being fitted to the club's Tiger Moths.

EVALUATION of the first Rollason-built Druine Turbulent (which made its first flight on January 1) "as a low-cost aeroplane for training, sport and recreation" is being carried out by Lt-Cdr. Jack Overbury, R.N.R., on behalf of the Tiger Club, owners of the machine. Among amateur enthusiasts who have almost completed the construction of Turbulents (working from Popular Flying Association plans) are the Rev. P. J. O'Kelly of Belfast, and 16-year-old Edgar Taylor of Spalding.

A RECENT Air Ministry statement that there are in existence a total of seven R.A.F. flying clubs (reported in our issue of January 17) has been amplified by the Popular Flying Association, who point out that there is in addition a further R.A.F. club based at South Cerney. This club and four of those listed by the Air Ministry are affiliated groups of the P.F.A. The Association has also assisted former Auxiliary squadrons to form groups: 604 Squadron has formed P.F.A. Group 107 and 600 (City of London) Squadron are at present in the process of affiliating their group to the Association.

OVER 90 members and friends attended the Hogmanay dinner-dance of the Scottish Aero Club. Last year's flying hours at Perth showed an increase of 442 hours over the 1956 total; analysis of the 1957 operations shows an increase of 505 hours on cadet flying and a decrease in club flying. During the year 16 club members and 22 cadets obtained P.P.L.s. The J. C. Henderson Cup for the best performance in P.P.L. tests was won by A. Band, with J. Watson second and D. Grieve third.



"Flight" photographs

Three-view photographs of the Rollason-built Druine Turbulent single-seater which, as reported on this page, is now being evaluated for the Tiger Club by Lt-Cdr. Jack Overbury.

ACTIVITIES of the Australian Women Pilots' Association during 1957 included the Women's Air Reliability Trial, and the annual general meeting in Adelaide during October. Winner of the reliability trial was Grace Cavanagh of New South Wales; while the Evelyn Follett Trophy for 1957 was awarded to Dr. Dorothy Rutherford for "outstanding flying in club competitions during the year," which resulted in her appointment as captain of the aerobatic team of the Royal Aero Club of New South Wales. Federal president of the Association is Mrs. Marie Richardson.

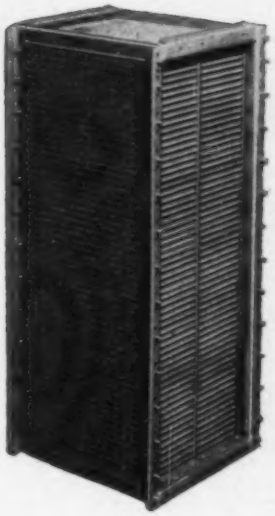
EXCEPTIONAL soaring conditions over France on January 8 resulted in eight flights exceeding 5,000 m (16,400ft) from the national centre at St. Auban. Mlle. Dupuy de Mery achieved a height gain of 22,300ft to an absolute altitude of 27,200ft in a Bréguet 901, and among seven other flights to heights of between 19,000ft and 27,200ft was one by Herr Fiesenig of Germany to 23,000ft in the prototype Wassmer Javelot. M. Landi also achieved 27,200ft in a Bréguet 901, with a height gain of 24,000ft.

EVENING wave-flying over Frocester during the last days of December is reported by the Bristol Gliding Club. No fewer than 150 members and guests attended the club's Christmas party at Nympsfield. Peter Collier, resident instructor-manager, is spending two months in West Africa, and on his return will organize the Bristol club's summer courses for 1958.

PROBABLE sites for the competitions during the 1958 National Soaring Week are Nympsfield (Bristol G.C.), Camphill (Derby and Lancs G.C.), Detling (Kent G.C.), Dunstable (London G.C.), Port Moak (Scottish G.U.) and Sutton Bank (Yorkshire G.C.).

GLIDING courses for beginners will be the subject of a number of informal talks at the Kronfeld Club, 74 (basement) Eccleston Square, London, S.W.1, to be held at 8 p.m. on the first Tuesday of each month, beginning on February 4. The talks, organized by the British Gliding Association, are intended to give newcomers to gliding advance details of the available courses.

Successful heat exchange and heat insulation



We design, manufacture and supply heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Viscount's anti-icing system. Similar units are supplied for the Fokker Friendship and the Bristol Britannia.

This thermal blanket is in refractory fibre cased in .004 inch (.1016 mm) stainless steel. It was made-to-measure, and is extremely light, the dimpled construction being responsible for its great strength. Specified for Rolls-Royce and Armstrong Siddeley jet and turbo-prop engines. Approved by the A.R.B.

High pressure fuel-cooled oil cooler for high performance gas turbine engines. This unit is used in the Armstrong Siddeley Sapphire S.A.7.

Delaney Gallay LTD

Vulcan Works, Edgware Rd., London, N.W.2 GLAdstone 2201

Success in our business doesn't merely mean the ability to manufacture, though we are extremely well equipped, even to the extent of having our own aluminium flux bath brazing plant.

Success, to us, means the ability to solve problems; to produce something that will do a new job, or perhaps an old job in never-before-experienced circumstances. And then, of course, to make it a practical and economical proposition.

We have enormous experience and wide resources. If we can help you in any way with heat control equipment, please contact us. We are always at your service.

We are now introducing Sealed Blankets for Civil Aircraft

DUNLOP | TYRES · WHEELS · BRAKES

● DUNLOP RUBBER COMPANY LIMITED · (AVIATION DIVISION)

the critical moment . . .

NATURE designs her creatures in a way that can never be equalled by the machine. Those that fly take off and land with smoothness, safety and with the means of immediate compensation for errors of judgement.

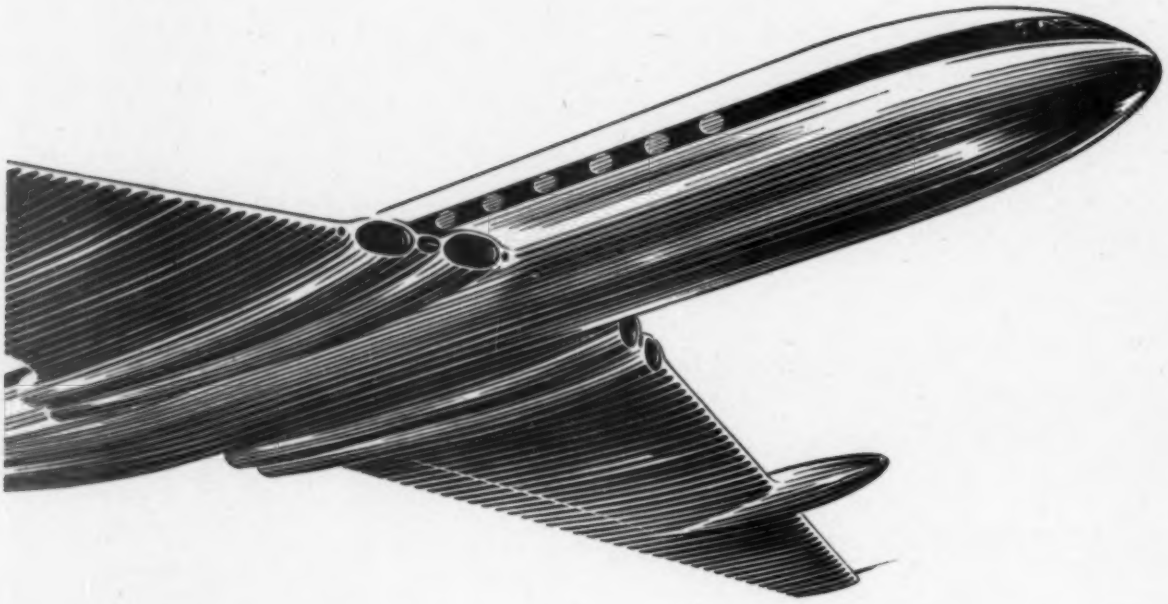
That machines have even approached this ease and facility is due to many skills: those of designer, constructor, pilot but also, in many of the world's aircraft, to Dunlop tyres, wheels, brakes and 'Maxaret' Anti-Skid units. Designed, tested and proved to give maximum efficiency at landing and take-off this vital equipment includes complete control against skidding, with provision for 'hold-off' in the event of a bounce landing.

For proven safety and efficiency at the critical phases of take-off and landing specify Dunlop.

'MAXARET' ANTI-SKID UNITS

FOLESHILL · COVENTRY

The New Comet for B.O.A.C. and B.E.A.



The New Comet is in full production for British Overseas Airways Corporation and British European Airways, for public service starting about a year from now. It has Rolls-Royce Avon jet engines.

Comets are flying half a million miles a month

Already 14 Comet aircraft are flying with the Royal Air Force Transport Command and the Royal Canadian Air Force, and in daily proving operations with B.O.A.C.

In 18 months they have flown the equivalent of 160 times round the world.

DE HAVILLAND

THE INDUSTRY

Canadair Re-appointments

REORGANIZATION and expansion of the sales division of Canadair, Ltd., Montreal, have been announced by Mr. Peter H. Redpath, vice-president for sales.

Mr. A. J. Lilly, who since 1956 has been deputy sales director and executive assistant to the vice-president for sales, is appointed director of sales and also remains executive assistant. He joined Canadair as a pilot in 1946 after service with Imperial Airways, R.A.F. Transport Command and Maritime Central Airways.

Mr. Louis S. Adamson, who has been with Canadair since 1942 and for several years been spare parts sales manager, is named director of service, parts sales and special projects.

Mr. Karl H. Larsson, who has been with the company since 1950, latterly as manager of commercial aircraft sales, is appointed director of that department. Before moving to Canada, he was active in Swedish aviation for 25 years, including ten years in charge of engineering for A.B.A., the Swedish airline, from its inception, and later for S.A.S.

Mr. Arthur G. ("Tim") Sims, who has been Canadair's sales service manager since 1948, is appointed director of military aircraft and missiles sales. Born in England, Sims moved to Canada in 1927 and became one of the nation's early bush pilots. Latterly he has had the responsibility of directing Canadair's technical representatives stationed in many countries.

Other Canadair promotions and appointments include those of Mr. H. J. Everard to manager of Sabre 6 and CL-41 sales and Mr. J. J. MacBrien to manager of missiles sales.

Jackaroo Aircraft in Africa

RECENTLY appointed aviation sales manager of Jackaroo Aircraft (Africa) (Pvt.), Ltd., of Salisbury, S. Rhodesia, is W/C. D. W. Balden, R.A.F. (retd.). The company is responsible for sales of the Thruxton Jackaroo four-seat Tiger Moth conversion throughout Africa. W/C. Balden's Service career, which began in 1933 at Cranwell, has included appointments as commanding officer of No. 261 Squadron, Malta (1940); of 112 Squadron, Western Desert (1941-43); and of R.A.F. station Woodvale. Prior to retiring from the Service last year, W/C. Balden was engaged on administrative duties at Kinloss.

W/C. Balden.

The African Jackaroo company is to operate a maintenance organization in Salisbury, and may establish an assembly plant. Chairman of the company is Mr. V. Britneff; managing director is Mr. D. Vaughan, overseas sales director of Jackaroo Aircraft, Ltd., of Thruxton, near Andover. Also on the Board of the company is S/L. J. E. Doran-Webb, managing director of Jackaroo Aircraft, Ltd., and of Wiltshire School of Flying.

Peter Twiss, Fairey chief test pilot, recently completed a helicopter conversion course with Air Service Training, Ltd., in order to obtain a helicopter endorsement before taking part in flight trials of the Fairey Ultra Light. He is seen with S/L. George Webb, the C.F.I.

Adaptable Panel

DIFFICULTY in foreseeing the ultimate number of instruments likely to be required for a new test rig makes flexibility of space on the instrument panel a most desirable feature. It was with this in mind that the "Wynunit" test rig instrument panel was designed by Wynstruments, Ltd., of Staverton Aerodrome, Gloucestershire.

Shown in the accompanying photograph, it consists of a basic frame 32in by 24in on which three 10in square and ten 6in square blank panels are mounted by spring-type quick attachments. As additional instruments become necessary they can be mounted on the appropriate size of panel and inserted in place of the blank. In this way instruments, switches, indicator lights and so on can be mounted individually as required without disturbing or affecting the appearance of the panel as a whole.

Wynstruments' test-rig panel.

The frame can be mounted on a wooden desk supplied by the manufacturers, or on a wall, from which it can be hinged to provide access to the back. Wynstruments can provide any required instrument mounted on a panel ready for insertion, or, alternatively, will mount the customer's own instruments.

IN BRIEF

Mr. S. Hinchliffe has been appointed to the Board of Dowty Seals, Ltd.; he is also production manager. From 1942 to 1948 Mr. Hinchliffe served as an executive officer in the Merchant Navy, and in 1953 he joined the Dowty organization as a production engineer, subsequently becoming works manager, and ultimately production manager, of Dowty Seals, Ltd.

* * *

A new publication by Muirhead and Co., Ltd., Beckenham, Kent, provides data on their synchros, servomotors, resolvers, motor tachometers and tachometer generators.

Mr. Raymond J. Pflum, who recently retired from the United States Navy with the rank of rear-admiral, has been appointed vice-president sales (and a member of the Board) of Napier Engines Inc., Washington, D.C., a company formed last July to handle the United States interests of D. Napier and Son, Ltd. Mr. Pflum, who has logged more than 12,000 hours as a pilot, both with the U.S. Navy and with Pan American and Eastern Airlines, had a distinguished flying record in World War 2 and in the war in Korea.

Mr. A. St. G. Prynne, M.A., A.M.I.E.E., has been appointed commercial manager of Racal Engineering, Ltd., and will be responsible for sales, service, contracts, and estimating. Mr. I. H. M. Cambell has been appointed chief of sales, with responsibility for home and export sales, publicity and advertising.

* * *

A Christmas vacation course at the Cheltenham factory of Smiths Aviation Instruments, Ltd., was unusual in that out of a total of eight students from West Country grammar schools two were girls. The course was designed as an introduction to the opportunities existing for physicists and engineers in the high-precision light engineering industry.

* * *

Mr. S. W. G. Foster, A.F.R.Ae.S., of 37 Broad Lane, Hampton, Middlesex, has resigned his position as technical director of the Broadway Engineering Co., Ltd., in order to devote the whole of his time to his design consultancy practice. He is at present engaged on various contracts including investigations of aerial agricultural equipment, airliner conversions with special-purpose equipment, and safety equipment.

"Flight" photographs

Air Chief Marshal Sir Thomas Pike, A.O.C-in-C. Fighter Command, inspecting the parade at R.A.F. Biggin Hill on January 16 when the Standard of No. 41 Sqn. was handed over to No. 141 Sqn. (the event is described on page 98). Accompanying the A.O.C-in-C. are (from left to right) S/L. J. Castagnola, C.O. of No. 41 Sqn.; W/C. P. D. Thompson, O.C. Biggin Hill; and A.V-M. V. S. Bowling, A.O.C. No. 11 Group. On the right is seen the handing-over ceremony, conducted by the Rev. V. Symons, vicar of Biggin Hill and officiating chaplain to the station.

Senior Medical Posts

TWO senior medical appointments have been announced by Air Ministry. Succeeding A.V-M. L. M. Corbet, who is retiring from the Service, A.Cdre. G. A. M. Knight is to be Deputy Director-General of Medical Services from March 28 with the acting rank of air vice-marshal; and he is succeeded as Principal Medical Officer at 2nd A.T.A.F. by G/C. J. F. Dales, who takes over on February 10 with the acting rank of air commodore.

Before his 2nd A.T.A.F. appointment A.Cdre. Knight was Deputy Director-General of R.A.F. Medical Services, and his wartime posts included those of P.M.O. at A.H.Q., Malta, and later with the Desert Air Force in Italy, while in 1944 he took command of the R.A.F. hospital at Wroughton, Wilts. G/C. Dales has since 1952 been on the Director-General's staff and he was previously Commandant of the Medical Training Establishment at R.A.F. Lytham St. Annes, Lancs.

A. Cdre. Appointments

BOTH carrying the acting rank of air commodore, two senior appointments have been announced by Air Ministry. G/C. W. E. Coles is to be S.A.S.O. at H.Q. No. 3 (Bomber) Group at R.A.F. Mildenhall in succession to A. Cdre. M. H. Dwyer, who has been selected for the 1958 Imperial Defence College course; and G/C. R. G. Seymour has been appointed Director of Equipment (B) at Air Ministry.

A. Cdre. Coles took the 1957 I.D.C. course and one of his previous appointments was as Head of the R.A.F. element of the U.K. Service Liaison Staff and Air Adviser to the High Commissioner in Australia. He was awarded the D.F.C. for operations in the Western Desert in April 1942 and later the A.F.C.; then in 1944 he won a Bar to his D.F.C. and gained the D.S.O. In 1952 he was made C.B.E. for his work with the jet advanced flying school at R.A.F. Middleton St. George.

A. Cdre. Seymour has been an equipment officer throughout most of his 29-year career in the R.A.F. and since the autumn of 1954 has served as Senior Equipment Staff Officer at H.Q. Constal Command. He was twice mentioned in dispatches during the war, was made C.B.E. in June 1945 and in March the following year was decorated with the Legion of Merit by the President of the United States.

SERVICE AVIATION

Royal Air Forces and Naval Aviation News

R.A.F. Promotions

GIVEN below is a final list of R.A.F. half-yearly promotions, which (like the others previously published) took effect on January 1:—

Marine Branch

W/C. to G/C.: E. W. T. Hardie.
S/L. to W/C.: L. R. Flower.

Airfield Construction Branch

F/L. to S/L.: E. Roberts.

Medical Branch

W/C. to G/C.: R. L. Scott, J. L. Roche, E. W. R. Fairley.
S/L. to W/C.: W. G. Alexander, S. M. Bieber.

Dental Branch

W/C. to G/C.: W. V. A. Denney, R. M. Brown.

Education Branch

S/L. to W/C.: A. Franklin-Jones, R. S. C. Cater, M. E. Claxton.

Provost Branch

W/C. to G/C.: S. N. Kettle.
S/L. to W/C.: W. F. McIlgrew.
F/L. to S/L.: S. H. E. Justin.
Flt/O. to Sq/O., W.R.A.F.: O. G. Cook.
F/O. to F/L., Branch List: G. G. McClelland.

Catering Branch

F/L. to S/L.: J. McLuskie.

Physical Fitness Branch

F/L. to S/L.: W. Wright.

Princess Mary's R.A.F. Nursing Service

Sq/O. to Wg/O.: V. M. Ashworth.

Recent Postings

BELOW are listed some R.A.F. appointments recently announced by Air Ministry:—

W/C.s L. F. Banks to R.A.F. Waddington, to command No. 83 Sqn.; K. E. W. Brace to Air Ministry, for duty for the Department of the Air Member for Supply and Organisation in H.Q., M.E.A.F.; W. S. Brundish to H.Q., Maintenance Command, for administrative staff duties; I. R. Campbell to R.A.F. Bruggen, to command No. 213 Sqn.; D. B. Fitzpatrick to Ministry of Supply; A. L. Fussell to Air Ministry, for duty in the Department of the Air Member for Supply and Organisation; C. A. H. Goudie to A.H.Q., Malta, for technical staff duties; C. G. St. D. Jeffries, to R.A.F. Binbrook, as O.C. Flying; A. C. Morris to Joint Services Staff College, Latimer, for directing staff duties; R. D. Stephens to Air Ministry, for duty in the Department of the Air Member for Supply and Organisation; G. H. Westlake to R.A.F. Geilenkirchen, for flying duties.

S/L.s J. Miller to R.A.F. Flying College, Manby, for directing staff duties (with the acting rank of wing commander); L. B. Noyes to H.Q., Eastern Sector, for control and reporting operations duties (with the acting rank of wing commander); H. A. G. Warren to H.Q., Arabian Peninsula, for administrative staff duties (with the acting rank of wing commander).

Reunions

TWO reunions are announced, both taking place in London on March 8. Details are as follows:—

No. 38 Group Old Comrades Association is holding its 12th annual reunion dinner at Londonderry House, Park Lane, W.1, at 6.30 p.m. for 7 p.m. Tickets (25s each) may be obtained from the hon. asst. secretary, Mrs. L. C. Rendall, Metropole Hotel, Brighton, Sussex.

No. 84 Squadron is holding its reunion at the Artillery Arms, 102 Rochester Row, S.W.1, from 7 p.m. to 11 p.m. Tickets (7s 6d each) are obtainable from Mr. O. Greenwood, Flat 11, 62 Belgrave Road, London, S.W.1.

Sweating it Out

"They number 120—all bachelors—and belong to an R.A.F. construction group which is preparing an alternative to air bases in Ceylon, about 430 miles away. They live a sort of 'R.A.F. Family Robinson' life on the Equator among the wild life, fruit trees, coconut palms and beautiful sarong-clad native girls."

(From a recent Reuter dispatch describing conditions on Gan in the Maldive Islands.)

IN BRIEF

H.Q., M.E.A.F., and A.H.Q. Levant are to be amalgamated from April 1.

* * * * *

H.M.S. *Victorious* was commissioned at Portsmouth on January 14 by Capt. C. P. Coke, R.N., and is to begin her trials on February 3.

* * * * *

The annual dinner of the R.A.F. Education Branch—open to past and present E.O.s and to serving civilian and retired R.A.F. education officers—will be held at Over-Seas House, St. James's, London, S.W.1, on Friday, May 9, at 7.30 p.m.

The transport may be different—but the service is the same

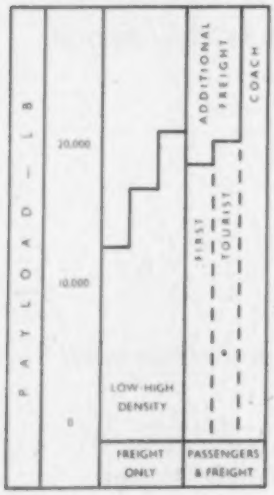
As Air Travel reaches out to all the countries of the world, so must the services which keep the aircraft flying. The BP Aviation Service is international; at hundreds of different airfields it supplies the essential fuelling and other services on which modern Air Travel depends.

AVIATION BP SERVICE *serves aviation well*

The international aircraft fuelling organisation of
The British Petroleum Company Limited

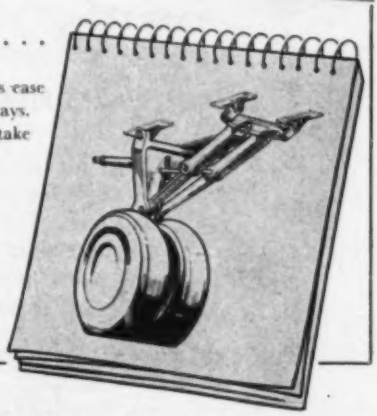
with the VANGUARD

Flexibility for operational economy is the essence of the VANGUARD. It offers route flexibility for all stage lengths from 200 to 2,600 miles; flexibility of operating altitude from 5,000 to 30,000 ft.; flexibility of rôle as high density passenger liner, luxury medium-haul or all-cargo services. With its 'double-bubble' fuselage the VANGUARD will carry up to 122 passengers in the top deck or ten tons of freight in the holds, or almost any combination of these up to a payload of 25,000 lb. At maximum payload, sea level standard day conditions (70° F), take-off length for 2,600 miles range is 6,500 ft. On a 1,750 miles sector this is reduced to 5,500 ft. With 20,000 lb. payload over 600 miles, 4,000 ft. is adequate. In effect the VANGUARD can operate from most regular airports in use to-day.



For your notebook . . .

Low-pressure tyres ease the stress on runways. Those which can take the VISCOUNT can also take the VANGUARD. Take-off and landing distances are modest.



VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE PROPELLER-TURBINE ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT555

CIVIL AVIATION

B.O.A.C.'S BIG ORDER

THE ceremony of signing the contract for 35 Vickers-Armstrongs VC.10s with an option on 20 (as recorded in *Flight* last week), was made an occasion for the release of a few further details about the aircraft.

Clearly, equipment competition on the North Atlantic is not to be allowed to stagnate; Sir George Edwards appeared confident that, in designing an aircraft to lift profitable payloads on Empire routes (Karachi to Singapore, with high temperatures and limited runway length, may be regarded as a typical critical case) an aeroplane had evolved that would have non-stop North Atlantic strength and range capabilities. The configuration of the VC.10 is significant, but so also is a promised increase in the power of the four Conways. It may well be the first aircraft to make use of additional power to improve runway performance rather than cruising speed. Only a modest increase in journey time between say, London and New York, may be expected with the VC.10, which will cruise about M=0.02 (about 13 m.p.h.) faster than the Boeing 707 at 40,000ft. Both types will be operating, in effect, on the "600 m.p.h. speed plateau," and the VC.10 will claim on the North Atlantic advantages of quietness and comfort rather than faster journey times.

Although similar to the Vanguard's in appearance, the fuselage is appreciably larger. It is, in fact, exactly the same maximum width as that of the Boeing 707 (148in) and the cabin floor width is 132in. It may be surmised that the underfloor freight space is also very considerable. It certainly exceeds the 1,360 cu ft of the Vanguard and probably equals the 1,600 cu ft of the 707. Vanguard-size access doors are evident on the model.

For good airfield performance the first VC.10s will not rely upon super-circulation by flap blowing; the specification does not include it, although Sir George Edwards said after the signing of the contract that "we think we know how to do it," and implied that later aircraft (or even the first, if development goes well) would eventually be equipped with blown flaps. Apart from the configuration—which, apart perhaps from the tailplane position (some 42ft 2in above the ground), can now hardly be called unconventional—there is little sign of the "certain unusual features" referred to last May, except what Sir George described as "slats" in the leading edge of the wing and increased thickness towards the root. The "slats" are presumably of the drooping, slot-forming type, divided into sections along the span. Sir George also said that "the engines are where they are to improve airfield performance."

In view of the uncertain industrial position surrounding B.E.A.'s jet transport Sir George emphasized that the VC.10 could be financed without "anything special being done" and that with the Weybridge, Hurn and South Marston factories available it was "no problem to build as many as we can sell." There had been substantial foreign interest, and it had been "difficult to keep them at bay without telling them anything." Asked what was the break-even figure, he replied "about 70 or 80, but it always gets away from you."

It seems self-evident that it was the increased dual-rôle flexibility offered by Vickers which led to B.O.A.C.'s option on 20 additional aircraft, and that (as we speculated in our issue of September 20) the Corporation will eventually dispose of its Boeing 707s in order to have an all-jet, all-Vickers fleet. Mr. Smallpeice, B.O.A.C.'s managing director, suggested after signing the contract that the Corporation hoped to have at least an all-turbine fleet by 1965-6, and answered every other question about equipment by referring to the growth of the airline's traffic during the next seven or eight years. Here, indeed, lies B.O.A.C.'s big conundrum. The Corporation have set themselves a target of a 300 per cent traffic increase by 1965-1966, and a 400 per cent increase by 1966-1967. They are in a better competitive position (and more heavily committed financially) than they have ever been before, and they are on the eve of a major ticket-selling campaign with the intention of ensuring that their share of the traffic expands at a rate greater than that of the world average of the past few years.

According to present policy, the VC.10 will not at first be used to replace the Boeings on the North Atlantic. A "fleet" of these aircraft will be delivered for service on the Empire routes in the latter half of 1963, and more will be delivered in the two succeeding years. Some of the VC.10s on option may be used to open up new routes which B.O.A.C. do not at present serve, such as the trans-polar route to the U.S. West Coast already secured by the Corporation, and the South Atlantic service.

(A VC.10 pictorial feature appears on pages 114-115 of this issue)

TWIN PIONEER CLEARED

AFTER extensive tests on the Twin Pioneer wing, Scottish Aviation announced on January 16 that the Air Registration Board had removed the flying restrictions imposed last month. (All these aircraft were grounded after a Twin Pioneer had crashed in Libya with the loss of six lives, including that of Scottish Aviation's managing director, Mr. D. F. McIntyre.) Reapproval has been granted without any modifications having to be made.

The aircraft which was lost was one of the first six built, and all subsequent machines were later modified to incorporate T.50 specification tubing, rather than T.2, in the front strut of the vee-brace. Tests have been carried out by the Department of Scientific and Industrial Research at East Kilbride on an Avery Schenck vibration fatigue tester, and the modified design has proved entirely satisfactory.

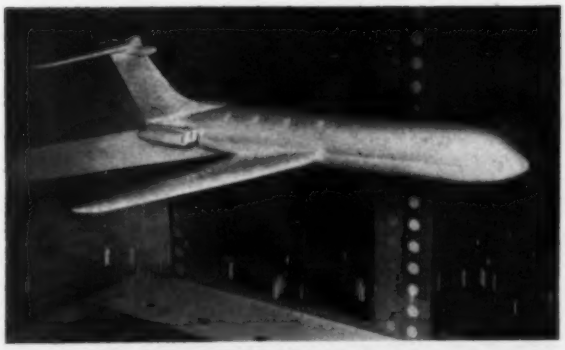
Mr. T. D. M. Robertson, Scottish Aviation's general manager, said recently that the Standard Oil Company, to whom the Twin Pioneer was being demonstrated in Libya when the accident occurred, are still interested in the type. A representative of the oil company will visit Prestwick shortly to continue the assessment of the aircraft for oil survey work and arrangements are to be made for another Twin Pioneer to return to Libya and continue demonstration flights.

INSPECTING THE OUTPOSTS

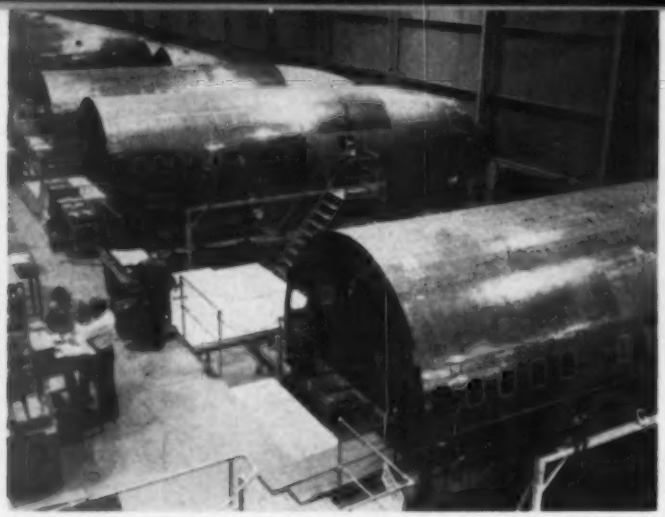
SHORTLY after signing B.O.A.C.'s VC.10 contract with Vickers, Mr. Basil Smallpeice, the Corporation's managing director, left London for a tour of B.O.A.C. establishments on the U.S. West Coast.

Long-range Britannia services to San Francisco and Los Angeles are planned to begin in the coming spring, and Mr. Smallpeice is to discuss this extension of services with B.O.A.C. managers on the West Coast. He will also pay a short visit to the Boeing Airplane Company at Seattle, where B.O.A.C.'s fleet of fifteen 707s are being built.

From the United States he will go on to Wellington and Auckland in New Zealand, and then to Australia, where he will visit Sydney, Canberra, Melbourne, Adelaide and Perth, for discus-



A VC.10 model (left) in the high-speed tunnel at Weybridge. Differences between this and the model shown on p. 114 and 115 are in the fin/tailplane fairing, engine pods and tail cone. Wing area of the VC.10 is 2,800 sq ft. (Below) At the contract signing on January 14 were (l. to r.): Mr. Kenneth Staple (B.O.A.C. secretary and legal adviser), Sir Francis Brake (B.O.A.C. Board member), Mr. Keith Granville (B.O.A.C. deputy managing director), Sir George Edwards (managing director, Vickers-Armstrongs Aircraft), Mr. Basil Smallpeice (managing director, B.O.A.C.), Air Marshal Sir Colin Weedon (Rolls-Royce), Mr. Charles Abell (chief engineer, B.O.A.C.) and Mr. L. Cooper (Vickers).



Pandit Nehru and two grandsons share the Friendship cockpit with Fokker's chief test pilot, H. V. B. Burgerhout, during a short flight from New Delhi.

(Left) In the foreground is the fourth production Boeing 707 in Transport Division's plant at Renton. The first three production aircraft are being specially equipped for conducting the C.A.A. test programme.

sions with Qantas and Tasman Empire Airways. Returning to the United Kingdom by way of Singapore and Beirut, he is due back in London on March 1.

TWENTY MINUTES TO L.A.P.?

"BETTER communications with the airport" is a heart-cry of every major city in the world. As airborne block speeds increase so does the traveller's impatience with the first and last frustrating miles of his journey. The problem may be no worse at London Airport than at many others, but the solutions adopted so far will certainly become inadequate long before 1970, when an estimated 12,750,000 passengers yearly will pass through the terminal. At peak periods this may rise to 6,000 an hour, sufficient to fill one 50-seater bus each way, each minute, on the Cromwell Road extension and the new South Wales radial road.

A promising solution, now under discussion by the M.T.C.A., is the construction of a monorail between Central London and the airport. Mr. Nugent, Parliamentary Secretary to the Ministry, has recently visited Germany to study the Cologne monorail, and is reported to be favourably impressed.

Monorail cars either straddle their rail or hang from it. In the Alweg system at Cologne, 100-seater cars are of the straddle type, and the track is carried on concrete posts about 18ft above ground-level and banked at the corners. Lateral wheels stabilize the cars by contacting the sides of the track and supporting wheels run upon the top surface of the rail. Although the Cologne monorail system is limited to about 50-55 m.p.h., much greater speeds are possible, and a 20-minute journey time from London to L.A.P. should be quite practicable.

A suggestion has been advanced by a British company, Air-Rail, Ltd., for monorail cars that could leave their track at the airport and run directly to the aircraft. Processing arrangements would then be made at the town terminal. The firm has plans for a monorail system between L.A.P. and Waterloo, Victoria or the Cromwell Road air terminal at an estimated cost of £8m; this is claimed by monorail advocates to be cheaper than a conventional railway line.

BOEING'S MEDIUM JET

FIRST information about the Boeing 720, the medium-range companion to the 707 family, was only released when United placed their order for 11 last November. Boeing have now given fuller details, including April 1960 as the delivery date for the first aircraft, only sixteen months after certification of the Boeing 707.

The "new and lighter-weight version of the Pratt and Whitney J57," referred to at the time of the order, is designated JT3C-7—the first reference to this suffix number that has been made. Precise engine powers may not be stated. Pneumatic starters are fitted on each engine, and the inner pair are also equipped with cartridge starters to make the aircraft independent of ground starting services. Although the airframe is very similar to that of the 707 (the aircraft is identical in size with the 707-120 ordered by Qantas, for instance), fuselage and wing structural weight has been reduced, and the lower gross weight has allowed a similar but lighter undercarriage to be fitted, with 13.50 × 16 tyres on the dual-tandem main wheels.

Structural modification includes the use of reduced skin gauges on the 720, so that only limited sections are interchangeable with the 707. The wings are made in five parts as before, but no fuel is carried inboard of the undercarriage support ribs. The centre section and inboard wing panels are permanently attached to the fuselage; production-type joints allow the outboard panels to be relatively easily replaced.

All the flying controls—including the inboard ailerons and spoilers—follow the practice established on the 707 series, but the power-boosted rudder (a feature of 707s with JT4 and Conway engines) is fitted to provide additional rudder power at low speeds with an engine-out. Other systems are very similar or identical to those of the 707. Pressurization is maintained at a differential of 8.6 lb/sq in above 22,500ft (sea level equivalent below) from air drawn through the ram scoop above the engine intake and further compressed by blowers driven from air turbines rotated by bleed air from the second-stage spool. An eight-inch-diameter connection has been provided for external air conditioning on the ground.

New data since the first order was placed are as follows:—

Dimensions: Span, 130ft 10in; length, 134ft 6in; tail height, 38ft 7in; cabin width, 148in; wing area, 2,433 sq ft; sweepback, 35 deg at 25 per cent chord; cargo volume (forward) 500 cu ft, (aft) 735 cu ft, total 1,235 cu ft.

Weights: Gross, 203,000 lb; normal take-off, 185,000 lb; maximum landing, 165,000 lb; normal landing, 142,000 lb; operating weight empty, 103,145 lb; maximum design payload, 33,000 lb. Passenger capacity, 110 first, 130 tourist; three operating crew.

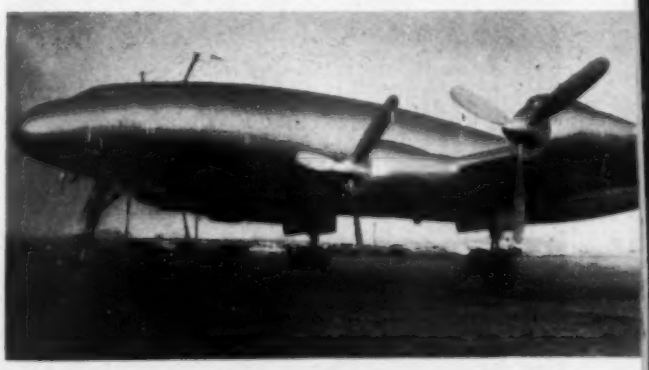
Performance: Cruising altitude, 15,000 to 40,000ft. Speed, over 600 m.p.h.; range with full passenger payload and fuel reserves, 3,300 miles. Take-off (normal gross weight), 5,400ft; (maximum gross weight), 6,700ft. Landing (normal landing weight), 4,850ft; (maximum landing weight), 5,500ft.

Fuel capacity is 8,403 Imp. gal. with options up to 11,222 Imp. gal., and the basic sales prices is £1.21m.

DEUX PONTS TO AMERICA

A DEMONSTRATION tour by a Bréguet 763 Deux Ponts began in America recently. The aircraft, F-BASQ, has been lent by Air France, who also supplied the crew of six and two ground staff. In charge of the tour is M. Pierre Bréguet, commercial manager of Bréguet, and he was accompanied on the first part of the trip by M. Henri Ziegler, general manager of the company. The *entourage* left Orly on January 16.

The sales tour—something of an urgent necessity for Bréguet, whose military contract for Deux Ponts has been cancelled—marks the thirtieth anniversary of a similar trip carried out in 1928 by Costes and Le Brix with the Bréguet *Nungesser and Coli*—the names of the pioneers who lost their lives attempting a non-stop transatlantic flight in 1927.



Pending sale, five of B.O.A.C.'s 13 remaining L-749s have been Cocooned (the R.A. Brand process). The Constellations, now flying only to Karachi and Bahrain, are being replaced on African and Eastern routes by Britannia 100s.

A Qantas Super Constellation lands at London Airport on January 16, having flown via the Middle East to complete the westbound section of Q.E.A.'s inaugural round-world service in both directions.

PROGRESS ON THE BALTIC

BROKERS on the Air Section of the Baltic Exchange are happily looking back over the results of 1957. Despite a slackening in the later months of the year, the overall level of activity was claimed to be exceptional.

Unlike airlines, brokers tend to measure activity in terms of value rather than volume, the former index taking account not only of the volume of traffic but also of the prevailing rates. Although in the immediate post-war period the bulk of the Baltic's air business was air freight—hence the Air Section being originally entitled "the Air Freight Exchange"—in recent years passenger traffic has been predominant. This change is apparently explained by the meteoric growth of inclusive-tour charter, and also by an increasing recognition among shipowners of the advantages of transporting ships' crews by air. Although there has been a tendency for more inclusive-tour contracts to be negotiated directly between airline and travel agent, by-passing the broker, the demand to negotiate the carriage of ships' crews has been steadily on the increase. To some degree this reflects the general condition of the shipping industry. When business is slack the need for rapid crew transportation is less, hence the reduction in air charter business last autumn when demand for shipping space sagged. But the general trend is that ship-owners are becoming increasingly aware of the real economies to be gained from what is superficially an expensive form of transport. Furthermore, as a recruiting device, shipowners find that air travel is a valuable inducement to prospective crew.

The main charter market for passengers other than ships' crews has been in the past for North Atlantic tourists, but British independent companies have always been handicapped in this field by the superior aircraft and stronger sales position of American and Canadian carriers. (The introduction of economy-class fares will affect this section of the charter market severely.) A large number of inquiries for passenger charter flights have to be turned away in the absence of the return loads necessary if attractive rates are to be quoted. This problem does not arise when time spent by the aircraft at the terminal airport is relatively short. For this reason functions such as sports meetings continue to provide useful business to the charter market.

Freight charters showed a heavy increase in 1957. While much of this is represented by emergency shipments such as ships' propellers or aircraft engines, an increasingly wide range of commodities are appearing in the charter contracts drawn up in the Baltic Exchange.

Rates of carriage are as dependent on availability of suitable aircraft as on demand for space. In recent years rates have remained fairly steady, for although there has been little increase in the number of aircraft available, improved utilization has permitted airlines to satisfy a growing demand. This position changed in 1957 with the acquisition by the independents of additional aircraft, and with B.O.A.C.'s reappearance on the charter market. Until the Corporation disposes of its Constellation and Argonaut fleets, fear that B.O.A.C. is quoting "sub-economic" rates will continue to cause some trepidation among the British independents.

This tendency towards lower rates will result in an even heavier volume of charter traffic in 1958. Widespread disposal of piston aircraft by scheduled airlines in the next few years will probably ensure that this trend continues. Brokers also believe that the easing of statutory restrictions on freight flights—particularly the rule that an aircraft must not be chartered to more than one customer at a time—would not only greatly increase the charter market, but would have little adverse effect on scheduled carriers.

SELLING THE FREIGHTERCOACH

AN Armstrong Whitworth Aircraft sales team, consisting of Mr. C. S. Emery (sales director), Mr. D. A. Woodley (assistant chief designer) and Mr. A. H. Stratford (civil aircraft adviser) are visiting New Zealand to discuss with operators the AW.650. The managing director of A.W.A., Mr. H. M. Woodhams, has expressed encouragement at the interest taken in the project by foreign operators and reconfirmed hopes that the first prototype will fly before the end of the year.

The same sales team will later visit South America and the Far East for talks with other interested operators.

RECORD B.E.A. PROFITS

PRELIMINARY unaudited estimates reveal that B.E.A. has achieved a record net profit of £1.2m after meeting financial charges in the calendar year 1957.

The gratifying rise in last year's profit over 1956 is mainly attributed to an improvement in revenue, for inflation has prevented rigorous control of expenditure from being expressed in a fall in the level of operating costs. Probably the most important factor in this improvement is an increase in the proportion of space sold from 63.6 to 64.6 per cent. This was accompanied by higher revenue rates, primarily because the fastest growth has been experienced by the more lucrative classes of traffic (passenger-miles increased by 16.5 per cent, freight ton-miles by only 10.3 per cent), partly because some fares were increased early in the year.

CAPT. A. C. MORGAN

WE regret to record that Capt. A. C. Morgan, D.F.C., chief pilot and technical manager of Irish Air Charter, Ltd., was killed on the night of January 15, when the Piper Apache he was flying fell into the Shannon Estuary near Waller Island shortly after taking off from Shannon airport *en route* for Dublin. An inquiry into the accident will be held by the Department of Industry and Commerce.

A. C. ("Monkey") Morgan, who was born in Wales in 1920, was educated at Wellington College, Berkshire, and commissioned in the Royal Artillery. He flew A.O.P. aircraft on the Central Mediterranean and West European fronts, and was awarded the D.F.C. for his gallantry on operations. After the war, Capt. Morgan operated his own Auster on aerial photography and air charter business from Weston airfield, County Kildare. Last spring he flew the Atlantic from Lock Haven to Dublin after taking delivery of the first Piper Apache for Irish Air Charter from the manufacturers, and was to fly a second aircraft to Ireland next month. Well known on both sides of the Irish Sea, his genial personality and enthusiasm will be much missed.

NEW HOPE FOR COLLISION WARNING

AT a meeting of the Air Transport Association in Los Angeles earlier this month, Minneapolis-Honeywell and the Federal Telecommunication Laboratories put forward new schemes for collision warning devices. Aerojet-General, also engaged on proximity warning indication, postponed a demonstration because of installation problems.

The Honeywell company favour a co-operative system (warning between equipped aircraft) of infra-red detection with a beacon and a scanner. The beacon would be designed to flash on and off at a frequency matched to the aircraft's magnetic heading. The scanning aircraft would then be able to detect any aircraft, regardless of position, in time to give 20 sec warning or, if no beacon were carried, detection of 20 sec would be limited to certain conditions and positions. The co-operative system would have the additional advantage of being able to differentiate collision courses.

The Federal proposal, employing interferometry techniques, is limited to coverage in the forward quadrant. Their suggestion is to use weather radar with four additional small antennae to measure the relative phase of echo energy reflected from the detected aircraft. A display tube with a "command" arrow to show the direction to steer and an arrow length to show the magnitude of collision threat would be used.

AS OTHERS SEE US . . .

THE Aircraft Owners and Pilots Association is the militant champion of private and business aircraft flying in America. Writing in the January newsletter, the vice-president of the Association has this to say about Chicago Midway's record number of 408,059 aircraft movements last year: "That's an average of 46.6 movements per hour, 24 hours a day, 365 days a year. Interesting sidelight: the Chicago total is 3.2 times that of London airport (busiest airport outside U.S. or possessions), yet British delegates in I.C.A.O. continually push for extreme rigid controls on all flying throughout the world comparable to the stifling regulations in effect in Britain *for safety reasons*. Result: there's virtually no civil aviation in Britain other than commercial airlines."

CIVIL AVIATION . . .

THRIVING ON IMPATIENCE

AIRLINES pondering whether world traffic is growing at 10, 15 or 20 per cent annually must envy the progress of the U.S. scheduled helicopter operators. Last year their passenger traffic increased by 118 per cent, and freight by 114 per cent. A few weeks before Christmas New York Airways foreshadowed replacement of their entire Sikorsky fleet with the larger Vertol 44s. Now Chicago Helicopter Airways, operating a mixed fleet of three S-58s, three S-55s and five Bell 47s, report that "the need for a substantially larger helicopter is already upon us." No mention is made as to the probable choice of new aircraft.

The latter airline (formerly Helicopter Air Services) was the last of the three certificated helicopter companies in the U.S. to introduce scheduled passenger services. Late in 1956 C.H.A. started flying between Chicago's two major airports. In April 1957 services were opened between the airports and downtown Chicago. By the year-end, 35,200 passengers had used the inter-airport service and a further 20,000 had travelled from either O'Hare or Midway airports to the downtown terminal at the Chicago Loop (Meigs Field). The number of passengers is expected to double in 1958, reaching 110,000.

John S. Gleason, Jr., president of C.H.A., points out that when American Airlines start jet services into Chicago early in 1959 "New York passengers will be 90 minutes from O'Hare; by surface transportation O'Hare is 75 minutes from the Chicago Loop," and suggests that "the helicopter will play an important rôle towards minimizing the new impatience that is sure to develop in tomorrow's air traveller."

Despite this phenomenal growth of traffic, C.H.A.'s passenger load-factor is only 35 per cent and the total volume of freight is still low. The main source of traffic and of revenue continues to be the carriage of mail. Rates paid in the past to helicopter operators for postal packages have been so high as to appear more in the nature of subsidies. But dependence on mail pay is dwindling with the advent of larger, more economical helicopters.

UNKNOWN AIRLINE

AS one of the larger—if not the largest—airlines in Latin America, equivalent in size to Swissair or Trans-Australia Airlines, Compañia Mexicana de Aviacion must claim to be one of the least-known world airlines. This obscurity stems from Mexicana's devotion to domestic services. By not belonging to I.A.T.A., and by not (apparently) reporting to I.C.A.O., the major Mexican carrier avoids the need to supply copious statistical details of its progress to the outside world.

Some years ago Mexicana had cause to be reticent. Its traffic fell steadily from 1952 till 1954, reflecting a slowing down in the Mexican economy; but since 1955 it has been on the increase again. Statistics for 1957 are not yet available but are expected to show continuing expansion.

Last year saw two important developments: the placing into service of four DC-7Cs, and the granting of a new route linking Mexico City and Chicago. Mexicana is no newcomer to the U.S., having operated to Los Angeles since 1935. The only other international route operated by C.M.A. is that between Mexico City and Havana. In addition to the DC-7Cs the fleet consists of four DC-6s, six DC-4s, nineteen DC-3s and three Fairchild Packets.

Until 1944 this airline was a wholly-owned subsidiary of Pan American. Subsequent sales of stock have now reduced PanAm's share to about 40 per cent, the balance being held by local Mexican interests. (PanAm also retains a small share, about 14 per cent, in the other Mexican carrier flying to the U.S., Aeronaves de Mexico.) Mexicana's excellent financial record, largely ascribed to high utilization, must not only be a source of satisfaction to its shareholders but must also ease the problems of aircraft procurement. Mexicana has not yet placed orders for jets.

BREVITIES

A DIRECT service between London and Warsaw, to be run jointly by B.E.A. and LOT, will start on April 1. Each airline will operate two, and later three, return flights weekly.

* * *

The inquest on the 46 victims of the Aquila flying-boat accident at Shalcombe, I.o.W., has been postponed until March 18.

* * *

The second Lockheed Electra was rolled out on January 3, three weeks ahead of schedule.

* * *

I.A.T.A. announce that European summer schedules will be introduced on April 1, three weeks earlier than in previous years.

* * *

Cruzeiro do Sul are financing the purchase of their four Convair 440s with a $2.1m credit from the Export/Import Bank.

* * *

The Britannia in which the Prime Minister, Mr. Harold Macmillan, is making his Commonwealth tour was the first four-engined aircraft to use the new runway at Peshawar, Pakistan.

* * *

In discussions on "ways of economizing on the London-Paris services" B.E.A. and Air France have considered the possibility of dispensing with meals in flight.

* * *

Wreckage of an aircraft found near San Gabriel in the Andes, at first supposed to be that of the B.S.A.A. Tudor *Star Dust* which disappeared in 1947, has now been identified as that of a Panagra aircraft lost as long ago as 1932.

* * *

Trans-Caribbean Airways have ordered one DC-8, bringing the Douglas backlog to 134. This is the first airline to order a single turbojet airliner. The aircraft, which will carry 176 passengers, will be used between New York and Puerto Rico.

South African Airways have stated that they will decide, before the end of February, whether to buy jet airliners.

* * *

Chantilly, Virginia, has been selected as the site for a new Washington, D.C., airport. It is 20 miles from the capital.

* * *

Philippine Air Lines have been unable to assist Garuda Indonesian Airways in their search for pilots and technicians to replace Dutch nationals.

* * *

S.A.S. will inaugurate a new service to Indonesia on January 24. Contrary to earlier reports, this service was arranged before K.L.M.'s operations to Indonesia were suspended.

* * *

Mr. Warren Lee Pierson, T.W.A. chairman, has been named acting president of the company in succession to Mr. Carter L. Burgess.

* * *

Although Deutsche Lufthansa and Aeroflot have now agreed to honour each other's tickets, direct flights between West Germany and Russia are unlikely for some time.

* * *

National Airlines are the first carrier to publish a pay scale for pilots flying jet airliners. The annual rates for senior captains range from $22,000 to $28,000 (£7,850 to £10,000).

* * *

The Canadian Department of Transport has grounded all U.S.-built Bell 47-J helicopters, pending completion of an investigation into a crash early in January involving one of these aircraft.

* * *

Manchester's municipally owned Ringway Airport handled 485,000 passengers in 1957, an increase of 24 per cent over the previous year.

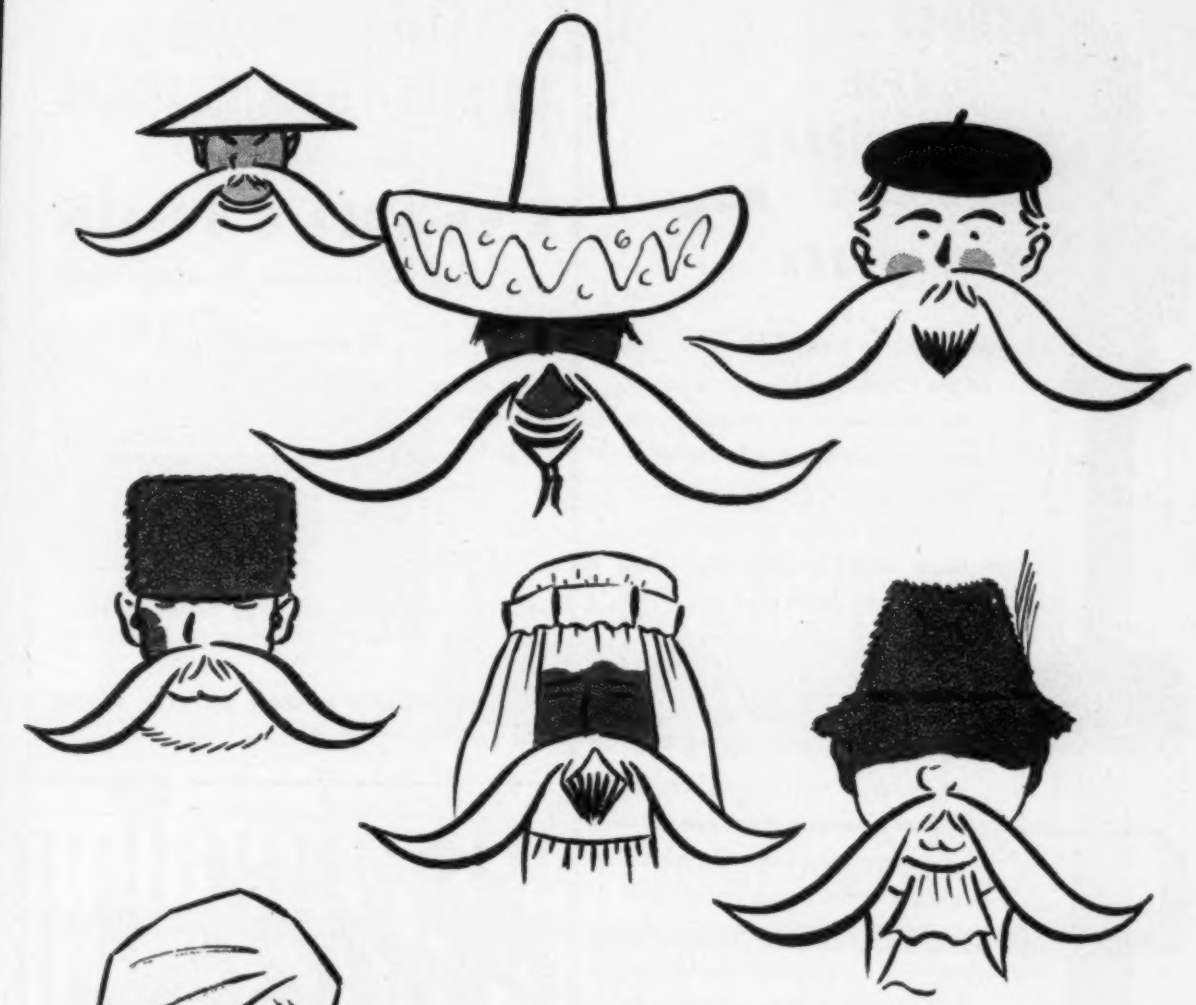
* * *

Air services between Edinburgh and the Isle of Man will be initiated by the Northern Division of Silver City Airways on June 1, 1958. Fares for the 140-mile journey will be £5 5s single and £8 15s return.

* * *

A Dove belonging to East Anglian Flying Services, Ltd., with seven people on board, made a forced landing on the beach at Dungeness on the afternoon of January 15. The pilot, Capt. H. Dennison, was injured.

With the canopy added, the shell of the first Vanguard fuselage is almost complete. Considerable panel deformation is needed to accommodate the "rectangular frame of reference" formed by the windscreen. This aircraft will fly in the autumn.



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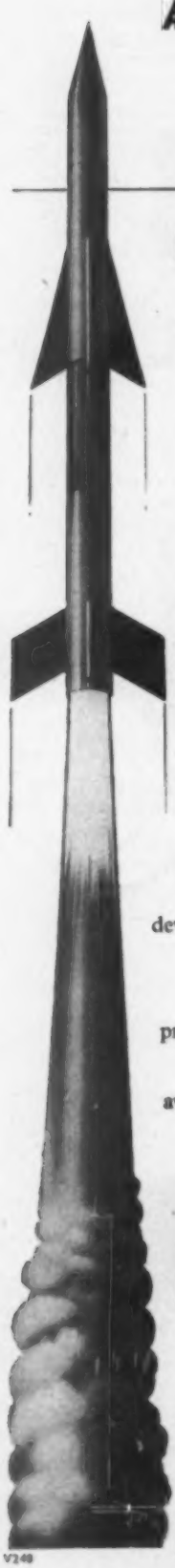
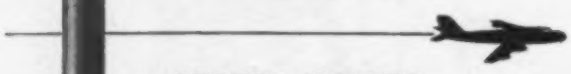


ACROSS NEW FRONTIERS



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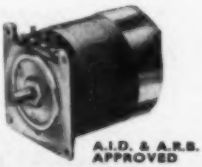

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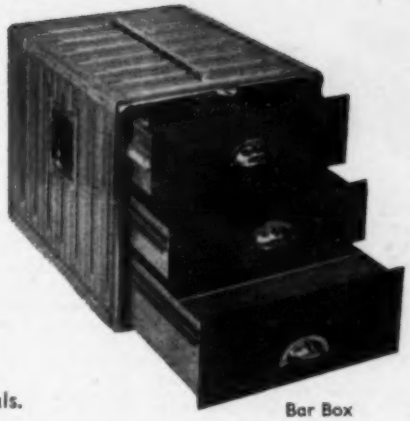

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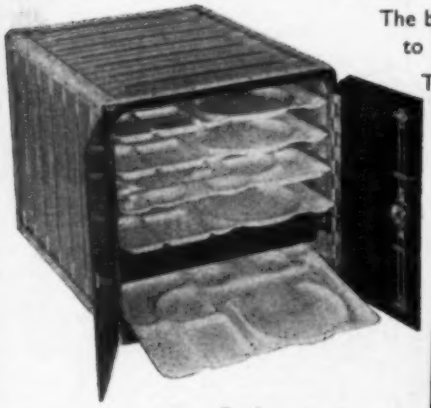

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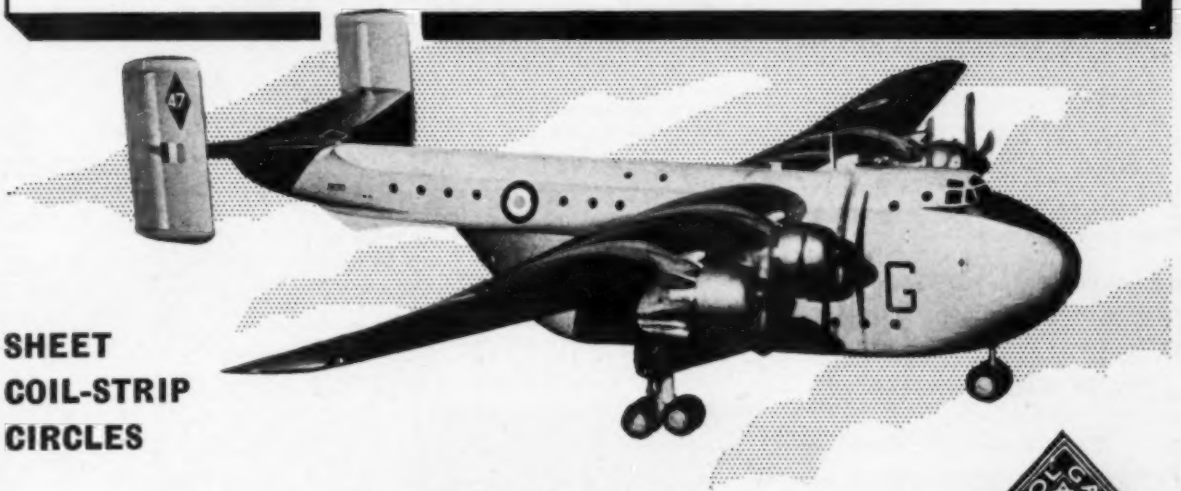

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APPLICATION No. 1593 for a service to be operated throughout the year on the route Derby-Nottingham (opt.)-Birmingham (opt.)-Luxembourg (tech.) Innsbruck.

APPLICATION No. 1594 for a service on the route Derby-Nottingham (opt.)-Birmingham (opt.)-Hamburg.

APPLICATION No. 1595 for a service on the route Derby-Nottingham (opt.)-Birmingham (opt.)-Dusseldorf.

APPLICATION No. 1596 for a service on the route Derby-Nottingham (opt.)-Birmingham (opt.)-Cologne.

APPLICATION No. 1597 for a service on the route Derby-Nottingham (opt.)-Birmingham (opt.)-Lyons (tech.)-Pisa.

APPLICATION No. 1598 for a service to be operated throughout the year on the route Derby-Nottingham (opt.)-Birmingham (opt.)-Hamburg (tech.)-Copenhagen.

APPLICATION No. 792/3 from Skyways, Ltd., of 7 Berkeley Street, London, W.1, for the removal of the present restriction on their Normal Scheduled Service on the route Lympne-Vichy and/or Valence (or Lyons for Valance) whereby passengers to Lyons must be carried onwards by coach to Valence and points to the south.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [7494

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